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NOTES AND COMMENTS.

Our Bengawan Fossil Ancestor.

At a recent meeting of the Anthropological Institute, Dr. Dubois showed to the leading anatomists of England the far-famed remains he discovered in Java. The remains consist of the roof of a skull which belongs to no known human or anthropoid type, and which is yet both human and anthropoid in appearance; a second and third molar, from opposite sides of the upper jaw, which are more human than ape-like; and a femur, in almost every respect distinctively human. Dr. Dubois, who sat beside the President and showed no trace of the malarious climate of Java, is completing a tour round the leading scientific centres of Europe. In France, he found that there was practically a consensus in favour of regarding the remains as indications of an animal that was human-like but not human: in Germany, they were thought to be ape-like and belonging to an ape. Now, in Britain, most have thought them human-like and of a man. These differences of opinion are themselves evidence that the anatomical gulf between man and apes has been exaggerated.

The Neanderthal skull was formerly the subject of an equally great conflict of opinion. Some anatomists declared that it belonged to an ape: some that it belonged to an abnormal man: some accepted it as evidence for the existence of a Quaternary type of man: others cautiously declared the evidence insufficient for any conclusion. At the meeting of the Anthropological Institute the same four groups of opinions were shown. Even to-day anthropology hesitates to speak with a certain voice upon the chief point of its own subject-matter.

As the normal human skull, the Neanderthal skull, and this Bengawan skull lay on the ' .ble together, it seemed clear enough that the three formed a series of grading forms. The differences between the normal and the Neanderthal skulls were much the same

in kind and in amount as the differences between the Neanderthal and Bengawan skulls.

Dr. Dubois set at rest all doubts as to the geological antiquity of these remains. He showed photographs of the bank of the Bengawan stream, from which they were taken; of the geological formation of the bank—a thick stratum of sandstone with a stratum of gravel-conglomerate under it, from which the fossils were obtained; of skulls, teeth, and other bones belonging to species and genera of mammals now extinct, taken from the same stratum as the human remains. Dr. Dubois thought the skull, the teeth, and the femur belonged to the same individual; this may be doubtful, but there can be no doubt that they all belong to individuals of the same race.

An interesting, but to our thinking, a crude, attempt was made by Dr. Dubois to represent in a genealogical tree—rising and branching through the various Tertiary strata—the positions occupied by this animal he calls *Pithecanthropus erectus*, and by men and monkeys. He considers *P. erectus* as representing the human race in late Tertiary times. We think he has done perfectly right in placing this animal as the direct precursor of the human race—but why give it such a name? If it is a grandparent of the human race, why not call it human? It is quite evident that the anthropologists of Europe have a difficulty in drawing a line of separation between it and present man. The difficulty has only just appeared, but further geological research will bring it more into prominence. At what point in the ancestry of man are we going to draw the line, and say, on this side of that line it is man, on the other side, ape? Dr. Dubois has drawn that line; he has drawn it separating Quaternary from Tertiary man. Tertiary man he calls *Pithecanthropus erectus*. The rest of Dr. Dubois' genealogical tree—showing the relationship in descent of apes to each other and to man—we do not think will be endorsed by any who have a knowledge of the anatomical structure of these animals.

The chief result of Dr. Dubois' discovery is this: Man in late Tertiary times had already completely attained the habit of erect posture, and locomotion had already set his hands free as the servants of his brain; but his brain and skull had not nearly attained the rounded completion of to-day.

Mr. Bland Sutton made one of the most interesting contributions to the debate. He pointed out that the Bengawan individual had suffered from Myositis ossificans—a disease peculiar to man, and coming on late in life. Evidently, also, man has carried the burden of his disease through a very long series of ages.

At a recent meeting of the Royal Dublin Society, Dr. Dubois showed his specimens to Irish naturalists. Professors Cunningham and Haddon agreed that *Pithecanthropus erectus*, Dubois, was a progenitor of the human race, but held that the Anthropoids branched from the line at a point lower down.

The Sanctity of Life in Africa.

The Congo Free State having paid the German Government £4,000 as compensation for loss, owing to the death of the latter's agent, Stokes, and having agreed to the trial of Major Lothaire in Brussels, this unfortunate business has been simplified. With the political aspect of the case we have nothing to do, but attempts have been made to prejudice the Congo Free State officers, by declarations that no European's life would be safe in Africa in the future; and that is a question which concerns naturalists. There never has been any doubt that Major Lothaire acted illegally in the execution of Stokes; and now, there is no doubt that his conduct was also recklessly injudicious. The technical illegality does not count for much no explorer can do anything in Africa without breaking many of the silly regulations of the Brussels and Berlin conventions, and disregarding ordinances issued by well-meaning officials. But when such illegalities affect the lives of Europeans they become more serious. The discussion this summer of the Bembiré incident has reminded us that acts take place in Africa which would never for a moment be tolerated in Europe. If a courageous official, in order to suppress piratical proceedings, were to punish the offenders, it would be the duty of those who have the interest of Africa at heart to see that he was given fair play, and not tripped up by mere technical illegalities. But no official ought to inflict a death penalty on a European, especially on a native of another country, without recognising that he is incurring a great and risky responsibility. Illegal executions can only be tolerated under circumstances of great urgency or of extreme provocation, and then carried out with dignity and judicial care. It is because Major Lothaire's action lacked these characteristics that it has been unanimously condemned. But random statements that his action has for ever broken European prestige on the Upper Congo may be dismissed as worthless; for so many Europeans have met their deaths in that region at the hands of rebellious natives and slave-trading Arabs, that our prestige has long been dependent on character and conduct, instead of on colour.

Dr. Donaldson Smith's Journey.

Dr. Donaldson Smith is heartily to be congratulated on the successful termination of the difficult journey from the Somali coast, across the countries of the Somali, the Galla, the Reschiat, and the Pokomo, to the coast at Lamu. This long journey has been frequently projected, but the fickleness of the Somali, the hostility of the Wa-suk, and the great tracts of barren, waterless wastes in the Lake Rudolf region, have prevented its achievement. The only previous European visitors to Lake Rudolf were Count Teleki and Lieutenant von Höhnel, who reached it from the south. Dr. Smith is the first to gain it from the north, and thus his work helps to bridge the gap between the

expeditions from Mombasa and Zanzibar and those from the north through Abyssinia. We are glad to hear, moreover, that Dr. Smith has made extensive scientific collections, especially of birds, the skins of which have been prepared by his assistant, Mr. Dodson. The expedition crossed the country of the Doko, a tribe of dwarfs, which were first reported by Harris, in 1844, and first seen and described by Borelli in 1890.

THE SPECIESMONGER IN HIGH PLACES.

WE are somewhat astonished at the temerity of Professor William Bullock Clark, of Johns Hopkins University, in sending to us, presumably for review, number 121 of the *University Circulars*, which is devoted to "Notes from the Geological Laboratory." We have often had the pleasure of praising the energy and work of Professor Clark, and he may possibly suppose that we shall look upon the stuff he now sends with lenient eyes. Mr. Clark must learn that we endeavour, to the best of our ability, to speak of everything submitted to us on its own merits, and we regret that we have to speak of his present performance in terms of severe condemnation.

The chief cause of our complaint is a paper entitled "Contributions to the Eocene Fauna of the Middle Atlantic Slope." This contains, within the limits of three pages, a so-called description of no less than thirty-two alleged new species. This is the kind of thing that is served up to us:

"*Trionyx virginiana*, n.sp.

Fragments of costals with characteristic tuberculated surface; pits broad; ridges far apart and irregular.

Loc. Aquia Creek, Va."

and

"*Teredo virginiana*, n.sp.

Tube cylindrical, long, irregularly curved; surface smooth; prominent, transverse partition near posterior extremity.

Loc. Many places in Maryland and Virginia."

Does Mr. Clark seriously suppose that his fellow-workers, the specialists on Reptilia or on Mollusca, can recognise these forms from such undiagnostic diagnoses? As for the so-called description of the shell for which the name *Pecten rogersi* is proposed, all we can gather from it is that the form in question is certainly not a *Pecten*, though it may be a *Chlamys*. We do not congratulate Mr. Rogers, whoever he may be, on being the recipient of this dishonour. It is, perhaps, unnecessary to add that none of these species are figured, neither are the numerous alleged new species of corals, which are proposed in this same circular by H. S. Gane, nor the alleged new species of Foraminifera introduced by R. M. Bagg. It is true that some plates are promised to posterity; but we know from sad experience how long it is before such promises are fulfilled, and such promise is at best an admission that the work as now published is incomplete. Grateful, meanwhile, for small mercies, we acknowledge that some

poor zincotypes illustrate two new species of *Cistella*, and a few other miscellaneous fossils. It is useless for us to hope that Professor Clark and his assistant, Dr. R. M. Bagg, teach their students how to produce in a proper manner the best kind of scientific work, for however eloquent their precepts may be, they in this case certainly do not better them by their example.

We are ready to praise those who are breaking new ground in American palæontology, and we are willing to admit that the active geologists of Johns Hopkins University are not the only hawkers of *nomina nuda et synonyma*; but it is time that this particular method of retarding the progress of science was put a stop to, and if that task is not undertaken by the enlightened universities of Europe and of America, we fail to see what hope is left for the overwhelmed systematist. It seems to us, after many years' experience of systematic work both good and bad, that the great desideratum at the present time is, not the multiplication of species whether good or bad, but the re-description, in the light of modern science, of the species that have already been named (we will not say diagnosed), and the arrangement of all species under their proper and finally determined names in the genera to which they are thus shown to belong.

We cannot sufficiently commend such work as is being done by Hall and Clarke in their revision of the Brachiopoda, by Hyatt, Beecher, and Jackson in studying the development of various fossils, by Wachsmuth and Springer in their monograph of palæozoic crinoids, and by Whitfield in figuring species described long ago but never yet figured. Men like this are bridge-builders and road-makers for science, the others only raise obstacles in her path.

On Nomenclature: A True Word in Jest.

Under the title of "Hérésies Taxinomistes," Professor A. L. Herrera has sent us an amusing pamphlet, published in *Memorias de la Sociedad "Alzate" de Mexico*, vol. ix. Professor Herrera begins by a series of quotations, of which the following are the best:—

"La Botanique est l'art de dessécher des plantes dans des feuilles de papier brouillard et de les injurier en grec et en latin.—Karr."

"Les auteurs, une fois plongés dans les études speciales, ont la rage des noms nouveaux et pompeux pour désigner des choses de minime importance scientifique.—Kennel."

He would show that nomenclature, as it exists, is a nuisance, unsatisfactory, and often absurd, and urges on authors the advisability of imposing on newly-discovered forms names descriptive rather of their peculiarities than of the persons to whom the author is indebted. To emphasise this matter, he writes as follows: "In order that we may see the superiority of the common names bestowed on humming-birds, we give a synoptical table. In the first column are the names given by the collectors of birds, who are, for the most part, natives little

favoured intellectually, and generally with disease of the liver, drunkards, or illiterates; the second column contains the names evolved by scientific men of an ordinary intelligence, who do not often suffer from cirrhosis, who do not get intoxicated, and who possess great erudition.

"Oiseau—mouche à gorge bleue. . . . . Caligène de Clémence.
——————— à poitrine couleur de vin. Lamprolème de Rham.
——————— à queue de poisson. . . Chlorostilbon de Canivet.
——————— violet grand. . . . . Trochile d'Alexandre.
——————— bleue à queue d'hirondelle. Tilmature de Dupont."

Professor Herrera thinks that if the Latin name were invariably compounded to have a meaning, such as the blue-throated hummingbird, it would be much more intelligible and instructive than if it were called after "Mademoiselle Clémence" or "Monsieur Dupont."

He also calls the attention of systematists to the inconvenience caused by not retaining one termination for certain groups; for instance, he quotes Malherbe's nomenclature of the Picidæ, in which the termination of every generic name ends in *picos* or *picus*, whereas in that of Swainson each genus is a distinct and unconnected word. He further emphasises his remark by asking how many scientific men outside the systematists of the group understand what is meant by *Spinolis zena*? Is it a mushroom, an ant, a rose, a spider, or a monkey?

We quite agree with Professor Herrera that the procedure of naming forms might be thus simplified, could we begin over again; naturally Professor Herrera shrinks from such a drastic remedy, since, as we already have a nomenclature extending over some 140 years, we must accept it, and, to our way of thinking, the only method of clearing the ground is to adopt strict priority in every instance. This, if persisted in conscientiously, must eliminate the endless synonyms now existing. But the obstacles in the way of even this rational method are very great; specialists cannot agree among themselves as to whether a form belongs to this genus or to that, and this point is well brought out in Herrera's own paper. He quotes ninety-five authors who have written on *Alauda cristata*, and shows that this bird has been put alternately into *Alauda* and into *Galerita* by almost each successive writer. Now, if diagnoses of genera are any good at all, it is either an *Alauda* or a *Galerita*; there should be no dispute, and all we can gather from Herrera's table is that generic descriptions are so vague that no one can decide to which genus the bird belongs.

There are many other points in this amusing paper which we should like to quote had we the space, but we must content ourselves with noting one crowning absurdity quoted by Herrera—that of *Enema gonzalezi*, on which he remarks, "Quelle politesse dans le langage de la science! Quels termes bien appropriés et distingués!"

As evidence of the lamentable work done in the past in overloading science with useless names, Herrera gives a table of names

accepted, names rejected, and total used in three volumes of the British Museum Catalogue of Birds, in which the synonymy has been worked out in so able a manner by the authors:—

Psittacidæ,	accepted	499,	rejected	2,794
Sturniformes	„	601	„	2,038
Picidæ	„	385	„	2,010,

and he points out that to designate 1,485 distinct birds, not less than 8,327 names have been used, of which 6,842 are considered as meaningless terms by the compilers of the catalogue. As Herrera truly says, "this is hideous." But as so many names are proposed by persons who, because they live at a distance from great libraries, are ignorant of previous writings on their subjects, we fear this "hideousness" will last to the end of time.

Erratics.

"Who drives fat oxen must himself be fat," and who studies erratic blocks must himself be erratic. At least, this is the only conclusion we can draw from the remarkable eccentricity of the *Glacialists' Magazine*, a so-called "Monthly Magazine of Glacial Geology," edited by Percy F. Kendall, secretary of the British Association Committee on Erratic Blocks, and published by F. H. Butler, London. The heat of the summer melts the ice and checks the advance of the *Glacialists' Magazine*; with returning winter its activity is renewed. Thus we explain the fact that the February and March numbers are published at the end of November, and come loaded with morainic *débris* that has fallen on them during the intervening months. Now, this is exceedingly interesting; but as a scientific observation its value would be increased if the erratic editor would only put the true date of publication on the wrapper. Why does Mr. Kendall take no notice of our previous warning (vol. vi., p. 231)? We have heard of only one reason for issuing periodicals with a false date, and that is the desire to gain an unjust priority for a published statement. This cannot be Mr. Kendall's reason, for he knows that, ethically considered, such action is on a par with the publication of a fraudulent balance-sheet. We cannot put such offenders in prison, but we shall continue to put them in the pillory.

Glacial Geology in the North of England.

We do not wish our remarks in the previous paragraph to disparage the splendid work now being done in the north of England by the members of the Glacialists' Association, who are bringing this branch of geology in England into line with that of the American school. We have received from Mr. T. Mellard Reade three papers, which are a further illustration of the energy with which glacial geology is being studied in the north of England. One contains a description of some tarns in the Brecknockshire Beacons,

which are supported by moraines attributed to small "nestling" glaciers. There is no previous satisfactory evidence of glacial action in this district, but these moraines certainly point to the former presence of permanent snow on the Beacons. A second paper, written in conjunction with Mr. T. D. Davies, describes some new sections on the Wirral Railway, at Seacombe, near Birkenhead. The Boulder Clay contains the usual assortment of the rocks of the north of England, and in the sands are marine shells, mostly in fragments, and some peculiar balls of clay. The authors contend that both of these are indicative of marine origin, though they admit that this view, as well as that which assigns the deposits to land ice, is full of difficulties. Our hope of overcoming these difficulties is largely based on the accumulation of carefully observed facts now being made by Mr. Kendal and his colleagues.

A Fresh-Water Station in Norfolk.

Our readers may remember that in NATURAL SCIENCE some time ago (vol. v., p. 370), we gave an account, with illustrations, of the portable fresh-water biological station established by Dr. Fritsch in Bohemia. We are glad to record that there is a probability of the example to which we called attention being followed in England. Mr. W. A. Nicholson, the honorary secretary of the Norfolk and Norwich Naturalists' Society, writes to us to direct our attention to a proposal brought forward in the recently issued *Transactions* of his society (vol. vi., part i.). "The systematic study of fresh-water biology," he says, "seems to be rather neglected in England. Many of your readers will recollect the description in your review a few months ago of the station in the lake district of Bohemia. Interesting particulars are there given as to apparatus, etc., required.

"Norfolk, with its Broads, hundreds of acres in extent, and its slow-running rivers and streams, is, I should think, the most suitable county in England for the study of the fauna and flora of fresh waters. The establishment of a biological station would, however, necessitate much more than merely local support.

"It is with a view to obtaining an expression of opinion on this subject, that I venture to bring forward the matter before you."

We have the fullest sympathy with Mr. Nicholson's object, and we hope that his scheme will be carried out. In the note in the society's *Transactions*, he points out that in the large and exposed lakes of Bohemia a portable house was necessary, as microscopical work could not be conducted on floating craft. He proceeds to write:—

"In the sheltered Broads and waterways of Norfolk, however, such difficulties do not exist. A wherry, fitted up for the purpose of investigation, would answer admirably. That there is important work to be done, of great benefit to science, in the zoology and botany of the Broad district, will be generally acknowledged. The discovery of

Cordylophora in Heigham Sounds, a few years ago, by Mr. Bidgood, was, I believe, an event hitherto unrecorded for that district. This organism is interesting, as *Cordylophora* is the only member [of its family known to inhabit fresh water]. Mr. Geldart gave us an account of its life-history at the time. I mention this as an instance that the district is not by any means thoroughly explored. In botany, Hickling Broad is the only known habitat in England of *Naias marina*, according to Bentham and Hooker. I have searched for it myself, but have not been successful in finding it. Again, *Tolypellopsis stelligera*, found in the Hickling district, is specially interesting, as, according to Mr. Bennett (*Transactions*, vol. iii., p. 382), up to 1882, it had been found nowhere else in Britain. There are several points in its life-history yet to be explained. For the study of the group of *Characeæ*, Norfolk waters offer great inducements, as they contain many species, several of which have not yet been recorded for the county. For the whole of the aquatic flora, Norfolk seems to offer special facilities for clearing up obscure points. To mention only one of these obscure points, the economy of *Stratiotes aloides* (Water Soldier) requires investigation, as, in spring, the plants rise to the surface for flowering, and in autumn sink down into the mud again for the winter, it is supposed for the purpose of ripening its seeds. The cause of the rising and sinking of this plant has yet to be discovered, though a theory to account for it has been propounded by M. Forel, of which mention is made in the "Bulletin of the Society for the Protection of Alpine Plants" (Geneva, 1895). It is a matter of doubt whether *Stratiotes* ever does ripen its seeds. Its reproduction may be entirely vegetative."

Biology in the Channel Islands.

In the October number of his interesting *Journal of Marine Zoology and Microscopy*, just received, James Hornell gives an account of the work done at the Jersey Biological Station during 1895. No less than fifteen workers have occupied tables at this station during the summer, most of them for a month or more, while many others have visited it for a shorter time. We note that the list given includes zoologists from France, Germany, Switzerland, England, Scotland, and Ireland. To afford working-place for all of these, an additional laboratory-table, with gas and water supply, has been erected in the room used as a museum. H. C. E. Zacharias, from Berlin University, intends to occupy a table permanently in the future, and will assist the Director of the Station in his morphological researches upon some of the rarer representatives of the fauna. An account has already been published in Natural Science (vol. vii., p. 416), of the experiments on formalin as a preservative medium. Mr. Hornell has also pursued investigations upon the difficult bait-problem, for which, in the absence of any subsidy, he deserves great credit. Under the care of the former co-director, Mr. Sinel, the Oyster-parks recently constructed at Green Island are now in a flourishing condition, and the shores of Jersey have been proved so suitable for oyster-culture that other parks are being formed.

In the present number of the journal, Mr. Hornell continues his

"Microscopical Studies of Marine Zoology" with the Corynidæ, *Sertularia pumila*, and the Cirripedia, all of which are illustrated in the plates. There is also a somewhat belated and rather curious article on *Spirula peronii* by E. H. L. Schwarz.

We wish the Jersey Biological Station and its interesting journal the success that they deserve.

ZOOLOGY IN JAPAN.

ENGLISH naturalists do not appear to be aware of the existence of a scientific journal published at Tokyo by the Keigyosha, and entitled *The Zoological Magazine*. This is not to be wondered at, for till recently the greater part of this journal was in the Japanese language. We have, however, received three interesting papers reprinted from it, all written in English. The first, by Professor K. Mitsukuri and S. Ikeda, March, 1895, figures and describes a gigantic Cephalopod which was caught in a net by some fishermen in the Bay of Tateyama not far from Tokyo, having been driven inshore by a violent storm. It appears to be of the genus *Architeuthis*, which numbers so many monsters, but the authors are unable to identify it with any known species. They do not, however, give to it any name, since they think it may possibly be identical with the gigantic Cephalopod which Hilgendorf saw in Tokyo and named *Megateuthis martensii* in the *Sitzungsberichte der Gesellschaft der Naturforschende Freunde*, 1880, a paper which the Japanese writers have been unable to see. The length of the body on the dorsal median line is 72 cm., the length of the longest sessile arm, namely, the left of the ventral pair, is 122 cm., the length of the tentacular arms is 291 cm. Although large, still these measurements are small compared with other species of the genus; and this fact, taken together with the unripe condition of the reproductive glands, suggests that "the animal was still immature—in fact, the baby of a giant." The second paper, by Professor Mitsukuri (June, 1895), announces the occurrence in Japanese waters of a species of *Hariotta*. This genus of Chimæroid fish was not long ago described by Messrs. Brown Goode and Bean from specimens collected off the coasts of Virginia, Maryland, and Delaware. The occurrence of so rare a genus in both the Pacific and Atlantic Oceans is, as Professor Mitsukuri remarks, "an interesting fact, well worthy of being placed on record as speedily as possible." The third paper, by Jiuta Hara (October, 1895), is a "Description of a new species of Comatula, *Antedon macrodiscus*," of common occurrence near Misaki, and belonging to the *Milberti* group. The author compares his species with *A. milberti*, *A. carinata*, and *A. rosacea*, but curiously makes no mention of Hartlaub's *Antedon japonica* from the same locality, which, though different, is quite as close an ally. This paper compares unfavourably with the other two in the absence of an illustration.

We may add here some personal information kindly supplied by

Professor Mitsukuri. Our readers are well acquainted with the Chinese habit of eating Holothurians. Certain species only are suitable for food, since many are rendered rather too indigestible by the size and number of their calcareous stipules. The Bêche-de-mer or Trepang Fishery, as it is called, is largely carried on about the Great Barrier Reef of Australia and in the China Sea (*see* NATURAL SCIENCE, vol. ii., p. 457). The particular species *Stichopus japonicus* also forms an important article both of food in Japan and of export thence to China, the value of the trade being estimated at £100,000 a year. At the instance of the Japanese Fisheries Commission, Professor Mitsukuri has been investigating the life-history of this species, in order to find some means of preserving, and, if possible, of propagating, the animal. He has already devised a plan and is having it tried on a small scale.

We are glad to learn from Professor Mitsukuri that the recent war is likely to stimulate scientific activity in Japan. "The victory is," he says, "in a certain sense the victory of science."

THE CELL-THEORY.

IN the *Quarterly Journal of Microscopical Science* (Nov., 1895), Mr. Adam Sedgwick, in the course of reply to Mr. Bourne's criticisms, makes some further remarks on the Cell-Theory which should be read by all biologists. He distinguishes between the statement of fact that "structures most conveniently called cells undoubtedly exist, as the ovum, spermatozoon, lymph-cells, etc.," and the theory that "organisms of Metazoa are aggregations or colonies of individuals called cells, and derived from a single primitive individual—the ovum—by successive cell-divisions; that the meaning of this mode of origin is given by the evolution theory, which allows us to suppose that the ancestor of all Metazoa was a unicellular Protozoon, and that the development of the higher animals is a recapitulation of the development of the race." So far as the statement of fact goes, Mr. Sedgwick thinks that the "phenomena called cell-formation" are not of primary significance. He gave special instances of the absence of this: in the mesoderm and in the formation of nerves; and he declared that the theoretical part of the cell-doctrine had led investigators to misinterpret facts. Against the theoretical part of the doctrine he continues to wage wholesale war, and most readers will agree that he has made a reply to Mr. Bourne the occasion of urging very weighty considerations against the older views. Incidentally, he makes a novel suggestion as to the nature of the conjugating cells of Metazoa. In the "Protozoa in which the amount of formed tissue is generally slight, and the structure of the body simple, conjugation can and does often take place between the ordinary forms of the species." But in the Metazoa "conjugation is impossible between

adult or ordinary individuals of a species, from mechanical causes." Conjugation is, however, a necessary part of their life-cycle, and, special individuals, of extremely simple structure—a structure so simple that conjugation between them is possible—are formed. These individuals are the ovum and spermatozoon. A dicœcious metazoon is a "tetramorphic species, consisting of male, female, ovum, and spermatozoon."

NEW MEMOIRS ON CELLS.

THE whole issue of the *Quarterly Journal of Microscopical Science*, in which occurs Mr. Sedgwick's paper referred to in our last paragraph, consists of memoirs upon cells and nuclei. Mr. J. E. S. Moore writes an extremely interesting memoir upon Elasmobranch spermatogenesis. He divides the spermatogenesis into two periods. The first lasts from the first appearance of the genital cells in the embryo until the actual production of spermatozoa begins. The nuclear divisions in this period are similar to the divisions occurring in the tissues of the body generally. In *Scyllium canicula*, the common dog-fish, when the nucleus is preparing for division, twenty-four chromosomes appear; in the division each chromosome splits longitudinally into two. At the end of the first period the cells are lying in the genital ampullæ in layers seven or eight cells thick. Avoiding technical details, it is enough to say that marked changes in the structure of the nucleus and the various parts of the cell mark the advent of the second period. When the chromosomes appear for the divisions of the second period, only half the number of those present in the first is found. In the case of the common dog-fish, twenty-four chromosomes appeared in the divisions of the first period; twelve chromosomes appear in the divisions of the second period. These, at first thick loops, become ring-like structures. The actual splitting of the chromosomes takes place across the long axis of the rings, which become pulled out into loops. A second set of divisions, in which also twelve chromosomes appear and divide transversely, gives rise to the actual spermatozoa. Apart from the exact details, the processes described by Mr. Moore have a theoretical interest. As he points out, Weismann laid great stress on the occurrence of a reducing division in the formation of germ-cells, that is to say, of a division in which the chromosomes did not divide, but one-half passed out to each daughter nucleus. Mr. Moore shows that such a reducing division does not occur in the spermatogenesis of the dog-fish: many botanists have shown that there is no evidence for it among plants.

To the same number Mr. M. D. Hill contributes a valuable memoir upon Fecundation, Maturation, and Fertilisation in *Sphærechinus* and in *Phallusia mammillata*, and Mr. A. B. Macallum contributes a most important memoir upon iron compounds in animal and vegetable cells.

Professor Ray Lankester.

We go to press early this month, so that what is new now may be a matter of common knowledge when this number is published. But we have the greatest pleasure in giving additional publicity to the appointment of Mr. Edwin Ray Lankester as a vice-president of the Royal Society. When Professor Lankester was a boy at school he became interested in fossil fish, and Huxley, who was a family friend, encouraged him in his pursuit, and was the external cause of his first important scientific publication, a monograph of the Fossil Fishes of the Old Red Sandstone. At Oxford he was a pupil of Rolleston's and a contemporary and friend of Moseley. His subsequent career as Jodrell Professor at University College, and as the present holder of the Linacre Chair at Oxford, is known to everyone. Were Francis Balfour alive, Lankester and Balfour would be the two great representative names of the latter part of the century among English morphologists. As it is, the older school has disappeared, and Professor Lankester alone occupies a great gap between Huxley and a host of younger men, many of whom are eminent, but none of whom is yet conspicuously in front of his fellows.

Professor Karl Pearson's Reply to Mr. Balfour.

We did not notice Mr. Balfour's "Foundations of Belief" in the part of our columns devoted to new books, for two reasons. The part of his interesting argument dealing with religion necessarily is outside the scope of Natural Science. The part which dealt with the foundations of science we were unable to recognise as having anything to do with any modern branch of scientific thought. The majority of scientific men pursue their studies and investigations without troubling about the metaphysical difficulties that lie behind, not only scientific thought, but all thought. Mr. Balfour seemed to us to imagine that science necessarily identified itself with the old, crude materialism of the Hall of Science School. It is quite true that Moleschott and Buechner many years ago identified scientific concepts with "things-in-themselves," but the few modern scientific men—such as Huxley, Clifford, and Karl Pearson—who have touched upon metaphysics, took the greatest pains to make clear that they were not "materialists."

As we did not review Mr. Balfour's book, we cannot find space for Professor Karl Pearson's criticism. But those who are interested in such ultimate problems should make haste to send to Mr. William Reeves, 185 Fleet Street, the publisher of "Reaction!" by Karl Pearson, price fourpence. We can assure them that they will find the pamphlet exceedingly interesting, and even though they may not agree with Professor Pearson, he will satisfy them that Mr. Balfour's treatment of science was a mere burlesque.

DIPTEROCARPS.

DIPTEROCARPS, or rather some species of the family, are to the tropical forests of Eastern Asia what the pine, the spruce, and the beech are to Europe. That is to say, they are gregarious, forming nearly pure forests of large extent in which one species has got the upper hand, to the exclusion of almost all others. This is the more remarkable since one of the chief characteristics of tropical forests is the great variety of kinds and the isolation of individual species. Thus one member of the family *Shorea robusta*, the Sāl tree, forms pure or nearly pure forests of vast extent at the foot of the Himalaya, from Assam to the Punjab, and in the hills of Eastern Central India. The chief factors which enable this tree to maintain its ascendancy are briefly these. The seed ripens at the right season of the year, at the beginning of the rains, after the forest fires of the hot season; it is produced in great abundance almost every year and germinates readily. The leaves of the seedlings are very large, and will thus choke other trees and shrubs which have sprung up with them. Last year's seedlings are, moreover, generally strong enough to send up fresh shoots when the rains set in, although they may have been burnt down to the ground by the jungle fires. Finally, the Sāl can endure a good deal of shade when young, remaining alive for many years under dense cover of grass, bushes, or trees. Sir Dietrich Brandis has had the advantage of working on the spot, and hence his remarks in the revision of the Order which has just appeared in the Linnean Society's *Journal* (vol. xxxi.) carry weight. An observation on those species which, though common, do not grow gregariously, but as isolated individuals, often far apart, is of much interest. They are by far the larger number, and many flower and seed abundantly. In three cases, however, in which a great number of seeds were examined, very few were perfect, many were worm-eaten, while in others the place of the embryo was filled up by dry, cork-like tissue. The author records a similar peculiarity in another family, Combretaceæ, which produce seed abundantly, but only occur singly in mixed forests. Among large quantities of seed examined only a few contained a perfect embryo. The circumstances which enable certain species to form pure forests certainly promise much interest as a subject of biological research.

Though Dipterocarps as a rule flower and seed annually, this is not always the case. Mr. Ridley states that in the Malay Peninsula every sixth year is unusually dry, and is characterised by the large number of species which only then produce flower and seed.

"MISCELLANEOUS INFORMATION."

FEW works justify their title more thoroughly than the *Bulletin of Miscellaneous Information*, issued at irregular intervals in connection with the Royal Gardens, Kew. Primarily intended to be "economical and not scientific," its contents have recently consisted, for the most

part, of diagnoses of plants possessing no economic value and of purely botanical interest. Some two years since, when the *Bulletin*—which, it must be remembered, is issued by the Stationery Office—was threatened with extinction, *The Times* stated that its publication was "one of the most useful functions discharged by the Royal Gardens." We should ourselves be sorry to estimate Kew at so low a value as is implied by this statement, but there can be no doubt that since the *Bulletin* has taken to publishing diagnoses of new species, it has become of greater interest to the systematic botanist.

We are, however, at a loss to understand for whose benefit the last number of the *Bulletin* has been issued. It is certain that science cannot be the gainer by the bringing together of such names as "Odontoglossum Impératrice de Russie," "Masdevallia Mary Ames," "Lælio-Cattleya Hon. Mrs. Astor," and "Cypripedium Madame Jules Hye"—to select only one or two examples of names which may be counted by dozens. The introductory note tells us that these lists are "indispensable to the maintenance of a correct nomenclature" and to "smaller botanical establishments"; yet the enumeration, which might easily have been completed by the first week of January, and issued as soon as finished, is not sent out until November. Nor is this all: the contents are as useless from a horticultural as they are from a botanical standpoint. What, for instance, does the student gain by the knowledge that *Tylophoropsis* is "a new genus of no horticultural interest?" If the Stationery Office chooses to compete with the scientific journals which are carried on at private expense, or with the various learned societies which devote themselves to the publication of scientific papers, it is of course at liberty to do so. But the public has a right to demand that its publications should be at least up to the level of usefulness secured by works that are not subsidised by Government.

European Elephants.

An important and interesting find of remains of *Elephas* has been made at Tilloux, near the station of Gensac-la-Pallue, France. The remains consist chiefly of tusks and teeth of animals of great size—the largest tusk recovered measuring 2 metres 85 centimetres in length, and being almost straight. The teeth are identified as those of *E. meridionalis*, *E. antiquus*, and *E. primigenius*, and figures of all are given in *L'Anthropologie* (vol. vi., no. 5) for October. Associated with the remains were those of *Rhinoceros*, *Hippopotamus*, *Cervus*, and *Bison priscus*, and numerous flint implements belonging to Mortillet's "Chelléen" and "Moustérien" ages. One of these implements, a "striker," was found underneath a tusk, to which it adhered. Three of the implements are apparently made from the same flint, and are identically similar in every character but form. There is, therefore, no reasonable doubt as to the contemporaneity of the remains and the tools.

BIBLIOGRAPHY OF ZOOLOGY.

IN our November number (p. 359) we announced the arrangements for the publication of an international *Bibliographia Zoologica*. The committee appointed by the American Society of Naturalists in Dec., 1894, has reported upon the plans of Dr. H. H. Field, in *Science* for November 15, 1895; they conclude their report as follows:—

"Your committee, having examined the matter in detail, would, therefore, report that they regard the plan as one worthy the fullest support of the American scientific world. They recommend it as worthy of financial support and would urge all publishers and publishing institutions to send all periodicals and other works (or in the case of books at least the correct title and a summary of contents prepared by the author) promptly to the central bureau. They would finally recommend the appointment of a permanent committee of ten to co-operate with similar committees in other countries in forwarding the movement.

"(*Signed*) Samuel H. Scudder, Henry F. Osborn, J. S. Kingsley,
H. P. Bowditch, E. A. Andrews, *Committee*."

We do not know of any higher authority on the bibliography of zoology than S. H. Scudder, and it is small wonder that American zoologists generally have welcomed the above report in a practical manner. All the money that was asked for has been subscribed, namely, $250 from the Elizabeth Thompson fund, $250 from the American Association for the Advancement of Science, and $50 from the American Society of Microscopists.

The scheme has been strengthened by affiliation to the Institut International de Bibliographie at Brussels, to which Lord Kelvin alluded in his recent address to the Royal Society. It is proposed to include animal physiology, and ultimately botany, in the plan, without altering present arrangements. All working zoologists who desire to keep pace with their subject should send their subscription of fifteen shillings to the publisher, W. Engelmann, Leipzig.

BIBLIOGRAPHIC INNOVATIONS.

WITH this number we adopt two suggestions which were made at the International Congress of Bibliographers, held last September, in Brussels, and which have since been emphasised by the above-mentioned Bibliographic Department of the Belgian Government, and by other foreign bibliographers. The first is the printing at the head of each article the index-number under which the subject of the article is placed in Melvill Dewey's system of decimal classification, a system that was adopted in its entirety by the Congress of Bibliographers. The second is the underscoring of certain words in the title of each article, the most important word or words having a full underscore, and words of less importance having shorter underscores. These are changes that appeal to the professed bibliographer rather than to the ordinary man of science. They may or may not be found valuable enough to gain universal adoption. But, in any case, we are yielding to a strongly expressed demand, and by familiarising English readers with the system, we do what little we can to prepare the way for that bibliographic reform which all admit to be an urgent need.

GENERAL VIEW OF THE VALLEY AT SPITALMATTE.
The arrows show the direction of the avalanche, and the dotted line marks the tract covered by it.

The arrows show the direction of the avalanche, and the dotted line marks the tract covered by it.

Rocks carried to a distance of 300 metres by the wind of the avalanche.

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Rocks carried to a distance of 300 metres by the wind of the avalanche.

I.

The Great Avalanche on the Gemmi Pass.

THE following is the substance of a report made by Professors Heim, Forel, and Chodat (of Zurich, Lausanne, and Geneva Universities respectively) on the subject of the great avalanche from the Altels Glacier, as the result of a personal and detailed study of the scene of the catastrophe.

On the snowy brow of the Altels (see the map, Fig. 1) is now seen a broad semicircular scar representing an ice-cliff of about 150 feet in height, and marking the point where the central glacier parted in twain. The two lateral glaciers ordinarily descend to a much lower level than the central one, which comes direct from the summit of the mountain. These have stood firm, though it is not easy to understand how that on the south side has been able to resist the shock caused by the loosening and headlong descent of the mass of ice abutting on its upper portion. In point of fact, an enormous lateral crevasse, which is visible above the line of separation, gives rise to fears lest the phenomenon should repeat itself. However, the Bernese engineers consider the shock to have been such as must have carried away everything that could possibly be detached.

According to the professors' observations, two transverse crevasses on opposite sides of the central glacier had lengthened until they at last coalesced. The continuous heat of the summer considerably enlarged the fissure. Thus the glacier became divided into a lower and an upper portion, the latter of which is still in place. On the night of the catastrophe there had been a violent *föhn* wind constantly blowing. The remaining points of detachment may thus have been loosened, while the water pouring into the crevasse and continuing its course below the glacier carried on the work of disintegration. It must be remembered that the phenomenon was facilitated by the fact that the strata on which the glacier rests have a remarkably even slope of 45°. The separation of the two parts of the glacier was thus bound to result in the precipitation of the lower portion down the mountain side. It is in the upper part that the slope of the rock-bed is most regular; lower down there are some slight undulations, while 200 metres above the Spitalmatte, which lies at the foot of the mountain, there is a projecting terrace almost vertically dominating it. It is over the edge of this terrace that the mass of ice was hurled in its bound on to the pasturage, clearing in part the ground just at the foot of the rock.

Here and there we found the grass at this part still green and free from blocks of ice or stone. In its frightful glissade from an altitude of 3,300 metres into the valley, which is 1,900 metres above sea-level (*i.e.*, a drop of 1,400 metres), the glacier, with its burden of moraine, must have acquired an enormous velocity. The Spitalmatte, together with the adjoining Winteregg alp, was a lovely glen, a true oasis in the midst of the rugged scenery (Pl. I.). It was intersected by hillocks, and on the west side, *i.e.*, that opposite the Altels, ran up to the foot of a rocky ridge (the Weissfluhgrat), which has an average height from crest to base of 300 metres, and stretches from the Weissfluh on the south to the Gellihorn on the north. At the southern extremity were four châlets not far from the frontier of Canton Valais. Forests of mountain pines cover the slopes towards the north and south. Last year 227 head of cattle, chiefly heifers, had been grazing there through the summer months. On September 13 they were to have been brought down to the lower valleys. Only three of them escaped destruction by the catastrophe, which took place on September 11, at 5.10 a.m. The three animals which were saved had doubtless strayed in the evening in a southerly direction, where they were found on the morning of the 11th, wandering in the forest.

On reaching the foot of the Altels, the avalanche, which up to this point must have consisted of one vast moving block of ice, measuring one-and-a-quarter millions of cubic metres, was reduced to fragments, at the same time that the heat generated by the shock converted these into a semi-fluid condition. Among the *débris* were to be seen some blocks of considerable size, but only a few exceeded two metres in diameter. With the velocity acquired in its descent, this river rushed across the pasturage and up the western slope of the valley to a height of 1,300 feet along the rocky wall of the Weissfluhgrat. Not being completely able to surmount this barrier, the main mass came surging back—like a vast sea wave recoiling from the cliffs—with such force that some of it returned to a height of one hundred feet up the eastern side. Isolated blocks, however, were hurled clear over the ridge into the adjoining valley, the Uschinenthal.

The avalanche was preceded by a terrific blast of wind which swept away châlets, trees, men, and cattle as though they had been feathers. This is proved by the fact that, far above the limit reached by the avalanche, hundreds of trees have been uprooted, and lie in regular rows indicating with mathematical exactitude the direction of the ærial current. These trees are for the most part of great size, several, indeed, having trunks one metre in diameter. Such as were protected by a large rock or a reverse dip on the hill-side have been spared. Others, standing with only half their height above such hollows, have had the exposed part blown off, while the subsequent on-coming of the avalanche has not succeeded in tearing up what was left of them, even when it has enveloped their base. This wind

produced a veritable bombardment of ice-dust mixed with stones, which has stripped the roots and branches of the trees laid low by the wind itself, and which must have killed man and beast before ever the real avalanche overwhelmed them. Further away the trees have only been denuded of their upper portion, the

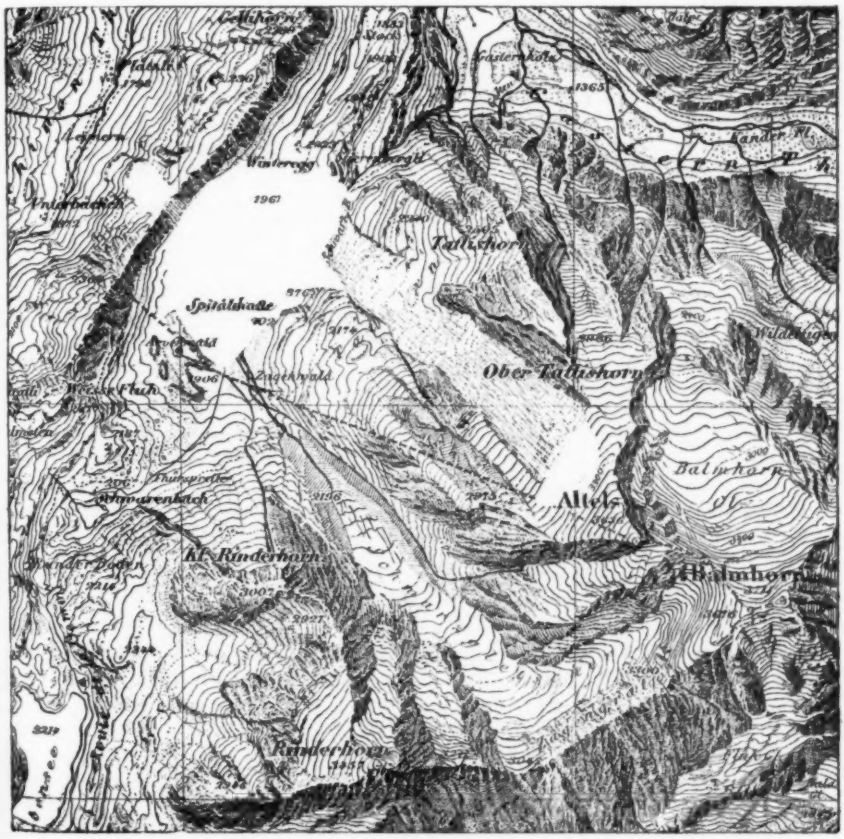

FIG. 1.—NEIGHBOURHOOD OF THE ALTELS GLACIER: from the Carte de l'État-Major.

The part of the glacier that was precipitated, almost up to the summit of the Altels, on the 3,300 metre contour line, is left white, as also is the ground covered by the avalanche. The course of the blocks of ice and snow is indicated by a dotted line between the Altels and the Schwarzbach.

(From *Le Journal de Genève*, Sept. 21, 1895, by kind permission of the Editor.)

branches composing which were transported to a great distance, and now form a compact line of *débris* among the far-off scattered trees, like the bank of sea-wrack left on open coasts after a fierce storm. Ice-bombs, too, round like cannon-balls, but

with an average diameter of one foot, which lay all about in the neighbourhood of the fallen mass, bore eloquent testimony to the extreme violence of the wind. On the way from the Hotel Schwarenbach, before coming to the Bernese frontier, the green pasture was strewn with these balls like a battle-field in old muzzle-loading times. The true avalanche, in its recoil from the rock-wall, has formed an immense rampart, separated from the rock by a deep trench. On the sides, under the stress of the enormous power of the wind, which, like the avalanche itself, was deflected by the Weissfluhgrat, blocks of considerable size were driven around as in a whirlpool, so as, at least on the northern edge, to have been forced back up the slopes of the Altels towards the entrance of the gorge leading to Kandersteg (Pl. II.). These different atmospheric movements were well marked owing to the disposition of the materials which came under their influence. Near the Winteregg, the trees, shrubs, and grasses were all bent towards the north, forming an exterior zone, which was more and more thickly covered with the dust, etc., raised by the catastrophe as the central mass was approached. A second zone, within the first, was found to consist of the loose rocks, etc., thrust aside by the head of the ice-mass as it dashed up the west slope; the inner edge of this zone was itself covered by a layer of ice and snow, representing the matter that kept pouring off from the sides of the central body in its upward progress, and also the results of the reflux which took place when its further advance was barred. Some of the ice and stones hurled against the Weissfluhgrat had adhered to it, being plastered, as it were, into the fissures and gullies. These masses were being constantly detached from their precarious position, and kept descending in roaring avalanches. On the two sides of the projecting terrace near the foot of the Altels, over which, as has been mentioned, the glacier leapt on to the pasturage, are two immense cones of detritus, composed chiefly of the stones which were drawn down in the wake of the true avalanche, and which have followed the course of two gullies, one on the north, the other on the south.

At Leuk the people say that it was on August 17, 1782, that the Winteregg alp was overwhelmed in a similar manner. The corpses of two of the men who lost their lives in that catastrophe were not recovered from their icy tomb till June in the following year.

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II.

The Endeavour after Well-being.

WITHIN recent years not a few writers, who may be credited with average intelligence and acquaintance with the subject, have protested that the familiar phrase "*The Struggle for Existence*" is inadequate to express the general dynamic aspects of animate nature, or to serve as the sole formula for the method of organic progress. Since the views of these writers have been variously regarded,—as imposture and truism, as illusory and absurd, as important and 'scientific,' it may be useful to attempt a brief summary of the question from the point of view of one who believes in 'Natural Selection' and 'The Struggle for Existence,' but in more besides. Little can be argued out in a mere summary, hence references to literature are here and there interpolated.

1. The idea of a struggle for existence, in the course of which the relatively unfit to given conditions are more or less rapidly eliminated, is probably as old as clear thinking. We find it expressed by Empedocles, Aristotle, and Lucretius, and, apart from those ancients, by several pre-Darwinian naturalists. (See, in illustration, Osborn's admirable history "From the Greeks to Darwin," and other historical works.)

2. But the idea remained on the level of a general impression until Darwin and Wallace gave it credence as an induction, and showed, moreover, in some detail *how the struggle operated as a factor in evolution*. Darwin was, he tells us, stimulated by the essay of Malthus, who had illustrated the struggle for existence among men; and it has been said that Mr. Wallace acknowledges a like indebtedness. (See Darwin's "Life and Letters.")

3. As a matter of historical interpretation, it may be noted that many theories, *e.g.*, in economics, appear to have arisen as afterthoughts justifying or expressing current social experience. For verification of this scientific anthropomorphism, in some measure probably unavoidable, see, for instance, Ingram's "History of Political Economy." On the same line, it has been suggested that the Darwinian Theory unconsciously projected upon nature *a generalisation derived from the keen competitive conditions of the industrial age*. (See Geddes' article, "Evolution," in Chambers's Encyclopædia.)

4. The colour of Darwin's picture of nature certainly suggests a very keen and continuous struggle for existence. He speaks of 'the battle for life' and 'the severe often recurrent struggle,' and he expresses recoil from a world which is so full of misery. "In a state of nature, animals and plants have to struggle from the hour of their birth to that of their death for existence." Mr. Wallace uses similar expressions. (See "Origin of Species" and "Darwinism.")

5. But it must be observed that Darwin used *many saving clauses*, of which one of the most important is:—"I should premise that I use this term [struggle for existence] in a large and metaphorical sense including dependence of one being on another, and including (which is more important) not only the life of the individual, but success in leaving progeny." ("Origin of Species," p. 50.) Similarly, Mr. Wallace says: "the struggle for existence, under which all animals and plants have been developed, is intermittent and exceedingly irregular in its incidence and severity." ("Darwinism," p. 139.)

6. Since we wish to know, not so much what even the masters have said, but what is actually the case, it would not be of special importance to consider individual statements, were it not that the opinions of the experts are presumably summations of cumulative evidence, wider than their works supply. Thus the generalisation that the struggle is most severe between closely-allied forms can hardly be supposed to rest on Darwin's half-dozen examples, not all of which are correct. In fact, having relatively few actual statistics of elimination except in cases, such as bison and beaver, where man has been the discreditable chief agent, we must still depend largely on the impressions of those who have had wide experience. Nor can it be denied that the conception of the struggle for existence has derived its force, not wholly from actual observation of what occurs, but very largely from inference as to what, it is believed, must occur. The necessity for its occurrence depends upon (a) the tendency of organisms to rapid increase, (b) the variability of the physical environment, to which organisms are at best only relatively well adapted, and (c) the secondary consequences of these primary facts.

7. Indecision of statement in regard to the stringency of the struggle is inevitable, being due in part to the complexity of nature, in part to the (alleged) fact that 'egoism' is continually moderated by 'altruism,' in part to the fact that the conception is based partly on observation and partly on inference. It is plain that the nature of the struggle must vary with the nature of the organism, thus that of the beech tree must be very different from that of the squirrel. It is plain that the phrase includes three forms of struggle—with related fellows, with foes, and with physical nature; therefore, the reality must be very diverse. The objects of competition include (1) continued individual existence and enjoyment, and (2) the continuance of family and race, both objects of manifold complexity. Finally, the struggle varies with the rate of reproduction and the variability of the environment. In

short, *it is a function of numerous—partly dependent, partly independent—variables.*

8. This conclusion—a familiar one, of course—that the struggle for existence is a function of numerous variables, leads one to agree very emphatically with Darwin that the phrase, to be true, must be used '*in a large and metaphorical sense.*'

9. But just as a reproduction almost inevitably falls short of the original, so many post-Darwinian pictures of the struggle for existence have tended to exaggerate the intensity of the struggle, and to ignore Darwin's saving clauses. Thus, generalising from the rivalry of the brown and black rat, a case for internecine competition by no means so clear as is often supposed, many have presented us —or at least 'the man in the street'—with what may be called '*the rat theory of life.*' This may be quite indifferent to the pure biologist, pre-occupied within his preserves, but it is practically important, since the moralists, economists, and theologians, who use or abuse biological conceptions, tend to derive their impressions rather from the epigoni than from the masters. And apart from less expert popularisers, who 'put a sword in the hand of a child,' as Bateson complains, has not Huxley said, "From the point of view of the moralist, the animal world is on about the same level as a gladiatorial show," and again, "He must shut his eyes if he would not see that more or less enduring suffering is the meed of both vanquished and victor." (See "The Struggle for Existence—A Programme," *Nineteenth Century*, February, 1888.)

10. Among the many cautions of which the biologist is or should be aware in appreciating the process of natural selection in the struggle for existence, the following may be noted:—(A.) *A secondary factor cannot claim rank as a primary one.* As Giard pointed out some years ago, and as we are all well aware, the primary, originative, or productive factors in evolution are the more or less unknown causes of variation; while the secondary, directive, or determining factors in evolution are the processes of elimination, selection, and isolation, and perhaps others. This is very obvious, yet even expert Darwinians, *e.g.*, Romanes, have described natural selection as 'creating' (a *lapsus pennæ*, of course), while an independent thinker, such as Hutcheson Stirling, who puts his finger, somewhat irritatingly perhaps, on this weak point and others, has his book described as worthless and contemptible. (B.) A negative factor should not be spoken of as a positive one. See Lloyd Morgan's proposal to substitute the phrase 'natural elimination,' except in those cases where there is really (intelligent) selection (*Proc. Bristol Soc. Nat.*, v., 1887–8). Wallace also said, "Nature does not so much select special varieties as exterminate the most unfavourable," and Darwin allowed the force of the criticism. (See Darwin's "Life and Letters.") (C.) The need for, and the efficiency of, natural elimination must vary (1) in relation to the number, nature, and amount of the variations

(see Bateson), (2) in relation to the occurrence of isolation (see Romanes), and (3) in relation to the intensity of the struggle. (D.) The struggle for existence, in the course of which elimination occurs, is complex, variable, etc., and not to be simply postulated as a force of nature. How vague we are as to what constitutes an 'elimination-determinant'; how silent we are as to the moderating factor due to the 'altruism' of animals!

11. Not only does 'the struggle for existence' appear somewhat too strong a phrase to use in describing the pursuit of such luxuries as a seventh wife, or that continuous endeavour after well-being which secures a few years longer life to the stronger constitution, or the intra-germinal combat of Weismann, but there are numerous facts of life which seem hardly inclusible within its elastic scope. Among these facts, which form *the other side of the struggle for existence*, are attraction between mates, reproductive sacrifice, parental and filial affection, the kindliness of kindred, gregariousness and sociality, co-operation and mutual aid, and altruism generally. Moreover, there are numerous cases, from, to cite extremes, the manifold variety of humming-birds to the specialisation of many pelagic animals, in regard to whose struggle for existence we can venture to say very little.

12. Observation shows us what we call physical attraction between cells which are at the same time entire organisms. Through some types of simple Metazoa the attraction remains cellular, *i.e.*, between the germ-cells. Gradually there appears a sexual attraction of entire bodies. With the development of a centralised nervous system, it becomes possible to speak of two organisms being aware of one another. The awareness is by and by accompanied by a reflex of emotion, the creatures seem to be fond of each other. Various æsthetic attractions are added to the primary ones, and, on an inclined plane, 'love' emerges. At the same time, however, there has evolved a parento-filial affection, and it is easy to understand how 'love,' broadened in the family, returns enhanced to the pair. Mixed up with this there is also the evolution of a sense of kinship, which is expressed in mutual aid.

13. "*Giebt mir Materie*," Kant said, "*und ich will daraus eine Welt schaffen*," and it is not difficult to imagine—impossible as it may be to prove—that from a protoplast with its ordinary functions, with its chemotaxis, thermotaxis, cytotropism, and more besides, there may have evolved sexual attraction, a feeling of kinship, and love. But what is difficult to understand is that a cultured science should scoff at those who point to the open secret that sexual attraction, kinship, altruism, and love are factors in life, moderating and transforming the struggle for existence. (See Spencer, Darwin, Fiske, Geddes, "Evolution of Sex," Kropotkine, Drummond, Coe, etc., etc.

14. Just as Empedocles recognised two ultimate forces—love and hate—so Spencer has insisted on recognising altruism as well as

egoism in Nature. "If we define altruism as being all action which, in the normal course of things, benefits others instead of benefiting self, then from the dawn of life, altruism has been no less essential than egoism. Though primarily it is dependent on egoism, yet secondarily egoism is dependent on it." "*Self-sacrifice is no less primordial than self-preservation.*" (See "Principles of Ethics" and "Principles of Psychology.")

15. As to the propriety of using the word altruism in the wide Spencerian sense, there may be difference of opinion (see "Data of Ethics"); and truly it is 'mere poetry' to have no scruple in reading the man into the beast or even into the plant and the cell. But so long as we do not attach unwarranted ethical content to altruistic action, there seems no confusion in asserting that motives comparable to 'altruism' and 'love' have their place beside 'egoism' and 'hunger' in the process of evolution.

16. As to the origin of egoism and altruism, we are equally in the dark in regard to both. We *suppose* that both are primary qualities, springing from the very heart of things; we only *know* that they rise from grade to grade with complex interactions (see diagram in "Evolution of Sex"). In the development of both there has probably been much elimination, some lines of which Spencer has suggested; both the ultra-egoistic and the ultra-altruistic are doomed. But elimination is directive, not originative. In regard to origin, Darwin suggested that the social sensations "were first developed in order that those animals which would profit by living in society should be induced to live together, in the same manner as the sense of hunger and the pleasure of eating were no doubt first acquired in order to induce animals to eat"; or was the master ironical in this return to *die alte Teleologie*?

17. Evolutionists who insist that the ordinary formula—the natural selection of variations in the struggle for existence—is adequate to express nature's method, or is, as our foremost zoologist says, "the one medium whereby all the phenomena of life, whether of form or function, are rendered capable of explanation by the laws of physics and chemistry," may be reminded (1) that their theory has not as yet been eminently successful in explaining many of the 'big lifts' in evolution, such as the acquisition of a body, the evolution of sex, the origin of mammals, the origin of the family, the ascent of man, and a score of others; (2) that the often-repeated psychological attempt to explain the higher aspects of human nature on this basis has hitherto failed, while even the Nestor of modern ætiology falls back on "spiritual influxes"; (3) that a denial of the importance of altruism among the beasts leaves the evolutionist who will account for the gentleman in the position of him who sawed at his own supporting branch, and leads to Huxley's strangely paradoxical conclusion, with which the moralists have sufficiently dealt, that ethical progress depends on combating the cosmic process—a con-

clusion that stands in interesting antithesis to Geddes' description of evolution as "a materialised ethical process."

18. And if it be said that attempts made to explain the 'body,' the colony, the pair, the mammal, the family, the gentleman, by recognising 'altruism' and 'love,' kinship and sociality, etc., as facts of life—not less inventive than 'egoism' and 'hunger,' competition and struggle—are mere interpretations, one is driven to ask if more can be said of the elimination theory. Has not Weismann admitted that the operation of natural selection is in no case rigidly demonstrable? Not that one would disbelieve in it on that account!

19. But if it should be said that all this is a tilt against a windmill, and that all are agreed that progress depends on much more than a squabble around the platter; that the struggle for existence is far more than an internecine struggle at the margin of subsistence; that it includes all the multitudinous efforts for self and others between the poles of love and hunger; that it comprises all the endeavours of mate for mate, of parent for offspring, of kin for kin; that love and life are factors in progress as well as pain and death; that existence for many an animal means the well-being of a socially-bound or kin-bound organism in a social *milieu*; that egoism is not satisfied until it becomes altruistic—then we *are* all agreed, but the colour of the picture has changed.

J. ARTHUR THOMSON.

551.2.

III.

The Constantinople Earthquake of July 10, 1894.

FROM time to time, but fortunately at long intervals, the country round Constantinople has been shaken by disastrous earthquakes. During the Christian era, the present city or its predecessor has been seriously damaged not less than thirteen times. The last occasion was on July 10, 1894, and the havoc then wrought must be fresh in the memories of all who read this paper.

H.I.M. the Sultan showed much interest in the investigation of this earthquake, which was undertaken by Mr. D. Eginitis, the Director of the Observatory of Athens. Official despatches were forwarded to the latter, and a Government steamer placed at his disposal, enabling him to visit rapidly the chief scenes of disaster. Another important result of the Imperial interest is the recent formation of a geodynamic section of the Meteorological Observatory at Constantinople. This has been placed under the charge of Dr. G. Agamennone, who for several years previously held a similar office at Rome. Delicate instruments have been, or will shortly be, erected at Constantinople with the object of founding there what is called in Italy a geodynamic observatory of the first order. Dr. Agamennone is also collecting statistics of the earthquakes felt in the islands and bordering countries of the eastern Mediterranean, and the Bulletins (2) which he issues every month are full of valuable records, many of which might otherwise have been lost.

Isoseismal Lines.—The central area disturbed by the last great earthquake is shown on the accompanying map (Fig. 1), which is reduced from that prepared by Mr. Eginitis (7). Of the three isoseismals (or lines of equal earthquake intensity) marked on it, the first surrounds the area of greatest destruction, in which well-built houses were thrown down. The second includes all places where badly-built houses were overthrown or strongly-made walls were fissured; the third those in which buildings were in no way damaged, but loose objects were displaced or overturned. These three isoseismals correspond approximately to intensities 9, 8, and 7 of the Rossi-Forel scale. The fourth, which is not shown on the map, bounds the area over which the shock was perceptible to ordinary observers. It extends as far as Janina, Bucharest, Crete, Greece, Konya, and over a great part of Asia Minor. Outside this line, Mr. Eginitis distinguishes a fifth zone,

in which the shock was sensible only to delicate seismographs and magnetic instruments. This zone is of immense extent: it includes practically all Europe and large areas in Asia and Africa. There is no reason, however, for placing any terrestrial limit to its expansion; for a good horizontal pendulum erected at almost any spot on the earth's surface would have registered the passage of the earthquake-pulsations. The time will soon come, we may well hope, when a system of these wonderfully sensitive instruments may be established at certain selected stations all over the world, and we may then be able to trace the pulsations of a great earthquake as they travel round the globe, perhaps more than once, after the manner of the air-waves from Krakatoa in 1883.

The chief feature of the first three isoseismals is one that characterises those of nearly all severe earthquakes in countries

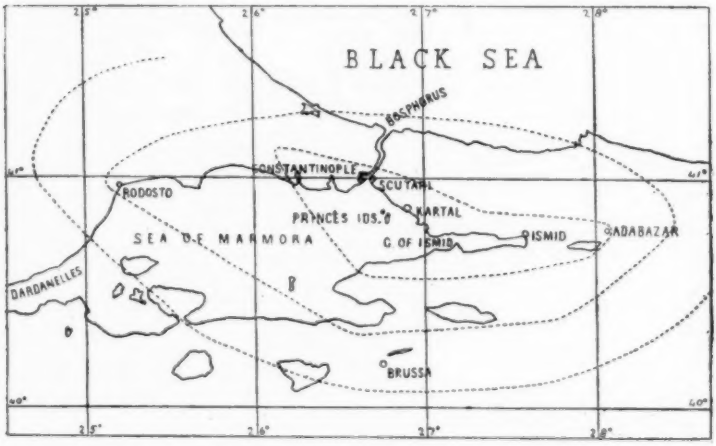

FIG. 1.—MAP OF THE CONSTANTINOPLE EARTHQUAKE.

where they are frequent and violent—that is, in which the rate of tectonic development is now rapid. This is their extreme narrowness compared with their length. The first isoseismal, for instance, is 175 kilometres long and only 39 broad, the second 248 by 74, and the third 354 by 175 kilometres. The natural inference is that the seismic focus is not a point, but of great length and parallel to the axes of the isoseismal lines.

Nature of the Earthquake and other Phenomena.—At Constantinople the earthquake was felt shortly after noon. Mr. Coumbary, the Director of the Meteorological Observatory, gives the time as 0.24 p.m. (mean local time). Three shocks were felt in rapid succession, there being hardly any interval between them. The first was the weakest. It was preceded for a second or two by a loud noise, like the rolling of many carriages on a paved road. It was horizontal, lasted four or five seconds, and continually increased in

intensity, but was at no time strong enough to overturn or displace loose objects. A slight pause, and then came the second and most powerful shock, vertical and rotatory in direction, and accompanied as before by a deep rumbling noise. It grew gradually stronger, and it was during the eight or nine seconds of its duration that nearly all the loss of life and damage to property occurred. After a similar pause followed the third shock, lasting five seconds, with the same underground noise, undulatory, and towards the end horizontal in direction. The total duration of the earthquake was thus about seventeen or eighteen seconds.

At many places within the first isoseismal the direction of the shock was determined, and this was always found to be nearly parallel to the shorter axis of the isoseismal. At others the shock was vertical or rotatory, and, apparently, this was only the case in the immediate neighbourhood of the epicentre. The reason of this appears to be that the first vibrations come from the nearest parts of the focus, and, therefore, in most neighbouring places, in a direction roughly at right angles to it, while the later vibrations come from the more distant parts and in a different direction; so that it is only near the focus that the rotatory motion should be distinctly observed. In Prinkipos, the largest of the Princes Islands, a chimney was split horizontally into three pieces, which were all twisted from the north towards the east.

Most of the secondary phenomena which generally accompany a great earthquake were present in a more or less marked degree. Some springs ceased to flow for a few hours, and afterwards returned to their original condition. Others increased in volume, or the water was disturbed. In several, though not many, places the ground was fissured. The most important crevice observed was three kilometres long, and 8 cm. in maximum width. This was in alluvial ground, at Hambarly, to the west of Constantinople, and 300 metres from the sea. It was, as usual, parallel to the coast, and was, no doubt, caused by the sliding of the unsupported mass. About three miles from Kartal, that is, close to the longer axis of the first isoseismal, the Kartal-Dardanelles cable, belonging to the Eastern Telegraph Company, was broken in several places. The fractures were quite clean, as if the cable had been cut with a knife, showing, as Mr. Eginitis remarks, that they were not the result of a great tension. He suggests that they were probably caused by the fall of rocks, but bearing in mind the position of the fractures, is it not more likely that they were due to a sudden displacement of the ocean-bed—to the formation, perhaps, of a fault-scarp which was but the superficial continuation of a slip that may have caused the shock? If this were the case, there would be some change in the depth of that part of the Sea of Marmora, though it might be too slight to be perceptible. Soundings were, indeed, made in this district, and they differed from those given by the English Admiralty Chart, but

unfortunately, it is not quite certain that they referred to the same spots.

Other evidence pointing to a sudden movement of the ocean-bed is furnished by the seismic sea-waves. Wherever it was observed, the sea first retired several metres—at San Stefano as much as 200 metres—and then, after some oscillations, returned to its original level. On the opposite side of the Sea of Marmora and outside the first isoseismal, however, no observations were made, and it is therefore uncertain whether the first retreat of the sea was universal.

Earthquake-Pulsations.—The island of Crete appears to be the most outlying district where the earthquake was actually felt, and this is about 450 miles from Constantinople. But to a distance far beyond this the pulsations spread outwards, and, as they passed each spot, the ground there rocked slowly and gently to and fro through an angle of, perhaps, not more than a fraction of a second. At Nicolaiew, in the south of Russia, a horizontal pendulum was so strongly disturbed that it was thrown out of position. At numerous stations in Italy, long and heavy pendulums recorded the passage of the pulsations. They were registered by magnetographs at Pola, Potsdam, Wilhelmshaven, St. Petersburg, Utrecht, Paris, and even at Kew, which is more than 1,560 miles from the seat of disturbance.

In Fig. 2 is reproduced the record of the pulsations at Siena, obtained with the aid of the Vicentini microseismograph. This instrument consists of a heavy pendulum, from the base of which a lever projects vertically downwards. The lower end of the lever is connected with the short arms of two very light horizontal levers at right angles to one another, and the longer arms of the latter end in fine points which leave their traces on a strip of smoked paper driven just underneath them by clockwork. Each of the divisions on the intermediate straight line corresponds to an interval of one minute. The record begins on the left side of the diagram, and for several minutes the movement was so great that Professor Vicentini, who happened to be watching the instrument, found it necessary to displace the paper sideways to prevent one of the pens from leaving the smoked surface. It will be seen from the figure that the movement of the ground lasted for more than three-quarters of an hour; and this was not due to the free swinging of the pendulum, for the period of the pulsations near the close was several times greater than the period of oscillation of the pendulum (9).

At many places it is possible to ascertain the moments when the first small movement became perceptible, and also when the larger pulsations began and ended. If the time at which the earthquake was felt at Constantinople were known with equal precision, we should be able to obtain a good estimate of the velocity of the pulsations. Unfortunately, this important element of the calculation is not free from doubt. Mr. Coumbary gives the time at the Meteorological Observatory as 0·24 p.m. (Constantinople mean time). At

first sight, one feels disposed to accept such a statement without question. The Observatory clock is not, however, regulated by transit, but by sextant, observations, and the latter are not nearly as exact as the former. Moreover, there is a considerable difference between Mr. Coumbary's estimate and those which Mr. W. H. Wrench, the British Consul-General at Constantinople, kindly obtained for me (5). He ascertained that the regulating clocks of two prominent watchmakers in the city were stopped, one at 0.20½ and the other at 0.21¾, the owner of each clock being confident that his time was correct. But Mr. Wrench informs me that there is no standard clock in Constantinople capable of giving correct time, so that the

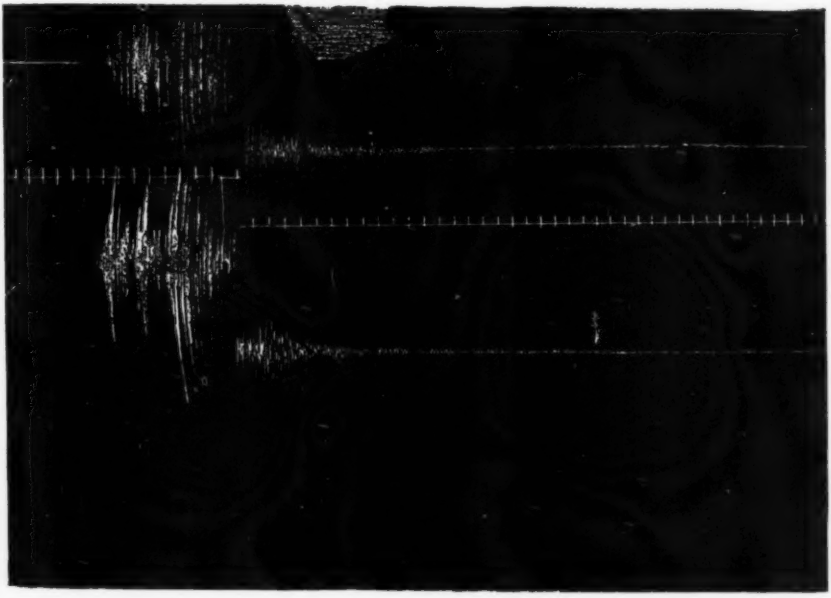

FIG. 2.—CONSTANTINOPLE EARTHQUAKE-PULSATIONS AS RECORDED BY THE VICENTINI MICRO-SEISMOGRAPH AT SIENA.

close agreement between these two estimates may be only accidental. On the whole, therefore, while recognising that a doubt exists on the point, I think that Mr. Coumbary's time is likely to be nearer the truth than the others. If it may be regarded as correct, then the larger pulsations must have travelled outwards with an average velocity of two miles a second; but if one of the other times be adopted, as Dr. Cancani thinks desirable (4), then the average velocity would be either 1·4 or 1·6 miles per second. The correct value thus probably lies between 1½ and 2 miles per second.

Depth of the Seismic Focus.—To ascertain the depth of the seismic focus, Mr. Eginitis has employed the well-known method used

by Messrs. Dutton and Hayden for the Charleston earthquake of 1886. The evidence on which his calculations are based is not described, but the result obtained for the depth is 34 kilometres or about 21 miles. Another estimate has been made by Mr. Lacoine (7). This is founded on the times of occurrence of the earthquake at different places, and the result arrived at is the same. The coincidence is striking, but it should not, I think, be inferred that the result is trustworthy, for both methods of calculation are liable to the same source of error, namely, the varying refractive powers of the different rocks traversed by the earthquake waves in their passage from the focus to the surface. The method of Dutton and Hayden is, moreover, open to a serious objection. If it were correct, it would follow that, for all earthquakes originating at the same depth, the distance from the epicentre of the line on the surface (the "index-circle") at which the intensity declines most rapidly would be the same. But it is conceivable that many earthquakes with the given depth of focus may not be perceptible so far as the index-circle, perhaps not even at the surface at all. Since it fails, then, in these cases, the method can hardly be expected to give correct results in others. Indeed, the problem of finding the depth of a seismic focus is one that at present lies beyond our range. The only guide our knowledge gives us is to look with suspicion on any estimate so great as twenty miles.

After-shocks.—The principal earthquake was succeeded, as usual, by many after-shocks, though these were less numerous than is often the case.[1] One reason for this may have been that a large part of the epicentral tract was submarine, and thus the district where they are most frequent lay beyond the reach of observation. At Constantinople four slight shocks were felt on July 10, the day of the earthquake, three on the next day, and ten more before the end of the month. After this they became still less frequent, though several months elapsed before the district returned to its usual condition (1, 2).

Origin of the Earthquake.—Mr. Eginitis points out that the axis of the first isoseismal coincides with the line of depression which begins at Ada-Bazar, and is marked by the Lake of Sabandja and the Gulf of Ismid. He suggests that the earthquake was tectonic—in other words, connected with the moulding of the earth's surface features. This he infers from the absence of volcanoes in the district affected, the great calculated depth of the focus, the elongated form of the isoseismal lines, the intensity of the shock, and the immense area over which it was observed. With this conclusion, probably, all geologists will agree, though not unnaturally they may desire more detailed information as to the way in which the moulding was effected. The evidence is too scanty to provide this with any certainty, but what there is seems to me to support the view that the earthquake was caused by a great fault-slip, the effect of which has been to deepen the Gulf of Ismid.

[1] See NATURAL SCIENCE, vol. vi., pp. 391–397, June, 1895.

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IV.

Recent Work on Seaweeds.

STUDENTS of algæ will welcome Messrs. Macmillan's new volume of Science Manuals, namely, that on the Study of Seaweeds, by Mr. G. Murray (1). The author meets a pressing need in providing a handy and trustworthy text-book. The study of algæ is continually advancing, and an immense amount of work has been done in recent years, so that the aspect of the whole subject has been changed by the progress of research. The results arrived at by the workers are scattered in many papers, both English and foreign, or are embodied in lengthy monographs which are not easily accessible. A wide-spread interest in seaweeds, or any exact knowledge of the subject, has been difficult, as there has been no book other than systematic works to guide the student. Phycologists like Mr. Bornet and others, who were able to undertake such a task, have been content to publish at intervals the results of their own observations on morphology and development; they have stopped short of arranging the results in text-book form. This is the more remarkable when we consider the splendid treatises on Fungi by Berkley and De Bary.

Mr. Murray's "Introduction to the Study of Seaweeds" is critical throughout, and the facts have been selected from abundant material with great care. The introduction deals with the biological conditions of marine plants, their economic uses, and their distribution in space and in time. The record of fossil algæ is, however, very small, that branch of phycology being somewhat starved for lack of material. A large field of investigation has been opened up in the study of plankton plants—the floating algæ of the open sea, the extent of which has been proved to be so much greater than that of the coast marine flora. "A recent estimate of the bulk of this flora," writes Mr. Murray (Introduction, p. 19), "compares the inconspicuous marine organisms of the Sargasso Sea with the bulk of the floating banks of gulf-weed that give this great tract of ocean its name, with the result that the microscopic forms enormously exceed the gulf-weed in aggregate mass." Mr. Murray lays special stress on the economic importance of these microscopic plants, which form the primary food of marine animals, and merit more attention than they have yet received from authorities on fishery matters.

In the main part of the work the author begins with the brown seaweeds, as being the more familiar forms; he discusses each Order, with the life-histories of certain typical forms, indicating any divergence that occurs in other members of the group, and giving in each case the geographical distribution of the genera. He then takes up the Chlorophyceæ, in which plankton forms are numerous and include the plants that cause the brilliant luminosity of tropical and other seas. The Diatomaceæ are treated as a separate sub-class by Mr. Murray, for, though they are nearly related to Orders under the Chlorophyceæ, they are separated off from these by their brown colour. Dr. Schmitz's sketch of the classification of the Florideæ forms the basis of arrangement for the Rhodophyceæ. They are divided into four orders, viz., the Nemalionaceæ, the Gigartinaceæ, the Rhodymeniaceæ, and the Cryptonemiaceæ. The grouping is made to depend entirely on the development and structure of the carpogonium, while the vegetative characters show considerable diversity even in genera placed side by side, as, for instance, *Delesseria* and *Claudea*, which are both placed in the family of the Delesserieæ. The Cyanophyceæ have been described last of all: they do not form a large group, many of them being fresh-water forms. The book is very fully illustrated with drawings that, with one or two exceptions, have not appeared in any text-book of general botany, many of them having been prepared for this volume. The coloured plates give illustrations of the typical British forms of the principal Orders.

The new forms recently described are very important, and include plants from North and South America, the East Coast of Africa, and the Cape of Good Hope, as well as from European shores. Mr. E. A. Batters (2) publishes those found lately in Britain; he adds two new genera, *Tellamia* (green) and *Hymenoclonium* (red), and five species, four of which are described for the first time. He has founded a new natural Order, Buffhamiaceæ, on the genus *Buffhamia*, one of the Phæosporeæ, on account of its peculiar vegetative character, a mode of classification also followed by Kjellman in his Phæophyceæ. Mr. Murray, in his "Study of Seaweeds" (1, p. 87), writes regarding the multiplying of Orders: "Considering how much remains to be discovered in the neighbouring groups, it appears to be scarcely justifiable to add, on grounds mainly of vegetative development, to the already excessive number of orders in the Phæophyceæ." Mr. Murray has carried out his own theory in this matter by sinking the Myriotrichaceæ into the Order Elachistaceæ, while he has placed *Stilophora* and *Spermatochnus*, which had each a natural Order allotted to it by Kjellman, provisionally under Sporochnaceæ.

Miss Barton (3) has made the Cape marine flora her own, and her "Notes on *Bryopsis*" have reference to Cape specimens; she figures and describes, for the first time, the haptera of *Bryopsis cupressina*, Lam., by which the younger plants attach themselves to the parent stem, and thus grow into colonies of bushy tufts; she adds

one new species to the genus, *B. Flannagani*, named after Mr. Flannagan, by whom it was collected.

Several lists of algæ have been contributed by Mr. Paul Hariot to the *Journal de Botanique*. Those from the Straits of Magellan (5) were sent to him by the late Professor Schmitz, and had been collected by Mr. Michaelsen. Among them he found one new species, which he named *Lithothamnion Schmitzii*. From California (6) he records three new species, a welcome addition to the flora from a little-known part of the ocean; and from the West Coast of Africa (4) sixteen species, one of which is new, *Calophyllis Lecomtei*, a small plant with very distinct pinnate branching.

Two new species of *Dermocarpa* have been recently figured and described by Mr. Sauvageau (14), *D. biscayensis* and *D. strangulata*, both of which were found growing along with *D. prasina* on a branch of *Sargassum flavifolium* that had been thrown up by a storm at Biarritz. The *Dermocarpa* cells were all in a vegetative condition; but in several cases he noted a slight median constriction, that seemed to indicate a division of the vegetative cell into a persistent basal portion, and an upper sporangial cell. Cell-measurements served to determine the new species, and such a formation would still further differentiate them from *D. prasina*, with which they might have been confounded. A revision of *Dermocarpa* was needed before, and the establishment of new species on such grounds points to its immediate necessity.

A posthumous paper by the deeply-lamented Professor Schmitz, of Greifswald, on the Florideæ of East Africa (7) has also been issued. German botanists are publishing a careful account of the whole flora of their territory in East Africa, and this paper forms one of a large series. Dr. Schmitz records from there six new species; and he has made *Gelidium variable*, Grev., which occurs in Ceylon as well as on the African Coast, the type of a new genus *Gelidiopsis*, placing it, on account of its vegetative character and development of the cystocarp, near *Ceratodictyon*. He finds the flora on this coast, as we should expect, entirely tropical, resembling that of the north-west region of the Indian Ocean; it is characteristically rich in encrusted forms. A large tract along the coast of Mozambique still remains unexplored; but the plants found nearer the south, in Algoa Bay and Natal, are very similar to those growing further north. It is a striking fact that the seaweeds from the shore west of the Cape are very different. Dr. Schmitz notes this as if for the first time, and suggests the influence of currents as a possible solution of the problem. Miss Barton has already published a convincing explanation of the great difference in the flora of these two contiguous regions. In discussing the Cape flora (*Journal of Botany*, vol. xxxi., p. 206, July, 1893) she says, "On the east, there is a strong warm current flowing southward from the Indian Ocean, bringing with it the tropical and subtropical forms to Natal and even to Cape Agulhas; while another branch of the same current flows direct from Mauritius, where the algæ are, as would be

expected, very similar to those at the Cape, though the two places are in such different latitudes. On the west coast, however, we find a different state of affairs. There is a cold current which comes up from the south, bringing icebergs as far north as 35° 50′, and this has naturally a marked effect on the algæ all up this coast."

Another paper, dealing exclusively with distribution, by Mr. Murray and Miss Barton (11), in the last number of the recently-completed volume of the *Phycological Memoirs* compares the Arctic and Antarctic marine floras. There are fifty-four species common to the north and south of the tropical belt, but not occurring within it, a fact that points to a uniform temperature of the sea from equator to poles in early geological ages. The authors quote from Dr. John Murray's "Summary of the Results of the 'Challenger' Expedition," the theory first introduced into geological speculation by Blandet (*Bull. Soc. Géol. de France*, ser. 2, vol. xxv., p. 777; 1867–68), that the size of the sun was much greater in the early stages of the earth's history. The sun was so great, relatively to the earth, that at the equinox its rays fell on the planet from pole to pole, and some degrees beyond, giving a day of twenty-four hours at each pole simultaneously. There would thus be a high temperature and sufficient light to permit of the "luxuriant vegetation that once flourished in these regions." Explain the facts as we may, it is very remarkable to find so many species common to two areas so entirely separated from each other. Another fact, disclosed by the distribution-tables, is the change from the northern Fucaceæ to the Sargasseæ of the tropical belt, and then to other Fucaceæ in the southern seas, "these last resembling the northern forms in general facies, but yet generically distinct in most cases."

In the department of morphology there have been several interesting contributions, notably those by C. Sauvageau on *Ectocarpus* (12, 15); it is just such observations and careful records that are necessary to complete our knowledge of even such common Algæ as those he describes. *Ectocarpus tomentosus*, he finds, has many-chambered sporangia with zoöspores, which, after swarming, come to rest and germinate without conjugation. It bears also single-chambered sporangia, which contain motionless spores, a condition of affairs which is as yet recorded for no other species. *Ectocarpus pusillus*, an equally aberrant species, has immobile spores in many-chambered sporangia. Mr. Sauvageau gives an account of four varieties of *E. pusillus* (15), viz., vars. *typica* and *riparia*, which are epiphytic on *Corallina officinalis* and *Polysiphonia*, and vars. *Codii* and *Thuretii*, which are endophytic, the one in *Codium*, the other in *Nemalion* and *Helminthocladia*. Though differing in habitat and general facies, they correspond in the size of the filaments and in the many-chambered sporangia with the large immobile spores, as also in the presence of "short flexuous fibres," noted by Mrs. Griffiths as so distinctive of *E. pusillus*, which, tendril-like, hold the filaments together, or serve to attach the parasite to the host-plant. Kjellman's classification of the

Phæosporeæ according to the motility or non-motility of the spores would exclude this species entirely from *Ectocarpus*, and necessitate a new genus of Acinetosporeæ, but Mr. Sauvageau is of opinion that, with our imperfect knowledge of the reproductive organs, more stress ought to be laid on morphological characters in classification, thus preventing the confusion that arises from a too ready multiplication of genera and species.

C. Sauvageau (16) has also made a most interesting discovery of unilocular sporangia in *Asperococcus compressus*. Buffham, who first noted their occurrence in the genus, found them growing in sori on *A. bullosus*; in the case of *A. compressus* they grow in irregular patches almost covering the frond.

In the last number of the *Phycological Memoirs* Miss F. Whitting, in conjunction with the present writer, has published an account of the fruits of *Macrocystis* and *Postelsia* (10). It is found that the sporangia grow in sori at the base of deep, over-arching furrows, a cross-section of which very forcibly recalls the conceptacles of *Splachnidium*, and confirms the view that the function of conceptacles in the brown seaweeds is mainly protective.

Mr. Murray (9) has given an account of a number of calcareous pebbles from a pond in Michigan formed of various species of Oscillarieæ, organisms that are commonly so encrusted only in hot springs. A comparison was made with some pebbles found in Lough Belvidere, near Mullingar, and the same Alga, *Schizothrix fasciculata*, was found predominant there also.

A beautiful specimen of *Pachytheca*, more complete than any of those formerly found, has also been figured and described by Mr. Murray (8) "not out of conviction that *Pachytheca* is an Alga, but because if it be a plant at all it is most probably an Alga." The specimen lay like a little ball in an outer cup, like an egg in an egg-cup, and the broken edges of the cup showed that it was composed of radial chambers which strongly resembled the sporangial rays of *Acetabularia*. But there the resemblance ceases, there is nothing in the verticillate Siphoneæ to correspond with the *Pachytheca* sphere.

A very interesting morphological paper (13) by Professor Phillips, of Bangor College, is devoted to red seaweeds, "the development of the cystocarp in Rhodomelaceæ"; it is well illustrated and very full and clear. The author follows closely the discoveries of Dr. Schmitz, comfirming and completing them. In *Rhodomela* he has been unable to trace any oöblastema filaments from the carpogonial cell to the auxiliary cell, or any fusion between them, but suggests that there may have been a transference of nuclear matter through fine pores—a kind of fertilisation process. He has been able to follow out most minutely the development that follows fertilisation, viz., the cutting off, from the presumably fertilised auxiliary cell, of the upper cell, which gives rise to the spores, the detachment and withering of the carpogonial branch, and the branching of the central cell

to form a layer of cells round the interior of the cystocarp. This layer, he suggests, may possibly supply the mucilage which is found in the mature cystocarp, and is afterwards ejected with the spores. He notes other interesting details in other species of the Order. There is a remarkable similarity among them in the structure of the procarp at the moment of fertilisation, and only when spore-formation has begun do they vary.

Dr. Friedrich Oltmanns published in Pringsheim's *Jahrbücher*, xxiii., 1891, an account of observations and experiments on the life-conditions of Algæ, all tending to prove the extreme sensitiveness of these plants to change of environment. Temperature and illumination had to be carefully attended to in any attempt to cultivate them; but the chief point of importance he decided to be variation in the salinity of the water. Any abrupt alteration of density seemed to be very hurtful, and he advocated careful and gradual change of water in aquaria. Subsequent researches (14) have caused him considerably to alter his opinion; he found that the mortality in the weeds he was dealing with was caused by undetected impurities in the water rather than by any change of medium, though that, too, was not unimportant. He was convinced that the oligodynamic effects described by Nägeli as being so fatal to *Spirogyra* cells had a potent influence on his plants. In order to secure healthy growth, he had, therefore, to be very careful to avoid using vessels made of metal to convey the sea-water. The poverty of the flora at the mouths of canals and rivers, while partly due, as he had supposed, to the constant alternation of fresh and salt water, was also largely caused by impurities and by the evolution of noxious gases due to decomposition. He was able to change the water in which the weeds grew with a variation of ten per cent. in salinity without the slightest effect on the plants. The best results in culture were obtained by keeping up a continuous stream of water through the aquarium, so gentle as not to carry off any swarm-spores. Sterilising the water supplied was advisable, if not necessary, to destroy bacteria and kill off all undesired spores. The presence of carbon dioxide in larger or smaller quantities was not of great importance within certain limits, so that the aëration of the water, which Oltmanns had thought hurtful in carrying off too much of the gas, had, in reality, no marked effects. One very interesting result was the possibility of propagating algæ by "cuttings." He grew a quantity of Polysiphoniæ and Ceramieæ in this way, only he had to see that each "cutting" of *Ceramium* included the small nodal cells, otherwise the plant would not grow.

Collectors of algæ will be glad to learn that J. P. Lotsy describes a simple method of preserving Red Algæ, so as to keep the cells and colour in their natural condition. The instructions are extracted from the *Botanisches Centralblatt*, vol. lx., pp. 15, 16. "Place the Algæ in a solution of 10 grms. chrome-alum in 1 litre sea-water for 1–24 hours. Wash carefully to remove all trace of chrome-alum,

then place the Algæ in about 100 c.cm. sea-water, and add at intervals of a quarter of an hour 5 c.cm. alcohol (96 per cent.), until there are added 25 c.cm. Transfer the plants to a 25 per cent. alcoholic solution and add as before at intervals of a quarter of an hour 5 c.cm. of alcohol, until 125 c.cm. of the solution contain 50 c.cm. alcohol. Then transfer gradually to 50, 60, 70, 80, 90 per cent. alcohol, and allow to harden." As most Red Algæ maintain their colour remarkably well in herbaria, all this trouble in most cases would be thrown away.

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13. **Phillips, R. W.**—"On the Development of the Cystocarp in Rhodomelaceæ." *Ann. Botany*, vol. ix., pp. 289–305, plate x. June, 1895.
14. **Oltmanns, Friedrich.**—"Notizen über die Cultur und Lebensbedingungen der Meeresalgen." *Flora*, vol. lxxx., pp. 35–38. Feb., 1895.
15. **Sauvageau, C.**—"Notes sur l'*Ectocarpus pusillus* Griffiths." *Journ. Botanique*, vol. ix., pp. 274–280, 281–291, 307–318. Aug., Sept., 1895.
16. ———.—"Note sur *Asperococcus compressus* Griffiths." *Journ. Botanique*, vol. ix., pp. 336–338. Sept., 1895.
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ANNIE LORRAIN SMITH.

V.

The Perth Museum of Natural History.

ON Friday, November 29, Sir William Flower inaugurated the New Museum of the Perthshire Society of Natural Science. It is now almost thirty years since this Society came into existence. On February 28, 1867, some sixteen gentlemen met in a small room in Perth for the working out of the geology, botany, and zoology of Perthshire. Among the number was the late Dr. F. Buchanan White. The meetings of the little Society were successful from the first; the members soon overflowed their single room, and new premises were obtained in St. Ann's Lane. These new premises were still of a temporary character, and the then president, Sir Thomas Moncreiffe, brought forward a scheme for the building of a suitable house for the Society, in which provision should be made for library, lecture-hall, and museum. This scheme Sir Thomas did not live to see realised, but it was pressed forward by his successor, Dr. James Geikie, under whose presidency subscriptions were invited and came in to the extent of about £3,000. On October 1, 1881, the Society entered into possession of its new house, the frontage of which, as it still exists, is shown in the photograph (Fig. 1). The ground-floor of the building contains the library and lecture-room; the upper storey has for fourteen years contained the natural history museum. This space was still altogether inadequate to contain the Society's rich and rapidly increasing collections, and in the summer of 1882, on the retirement of Dr. Buchanan White from the presidency, Mr. Henry Coates, the new president, proposed that the labours of his predecessor should be crowned by the erection of a new museum. Sir Robert Pullar headed a subscription list with a donation of £1,000, and other friends of the Society contributed some £2,000 more. This new addition, which stands immediately behind the old buildings, is that which Sir Wm. Flower came down to open the other day, and with it the present paper has to deal. The main object of the Society was from the first to obtain a separate museum, to be devoted to the fauna, flora, and geology of the county. The architects, Messrs. J. & G. Young, have taken extreme pains to produce a building in all respects suitable for the purpose, and we believe that we possess a museum that will compare favourably with any provincial museum in the country for adaptation to

systematic arrangement, for perfection of lighting, and for quality of material and workmanship in all its internal fittings.

The new hall measures 44 feet by 34 feet. A gallery 15 feet from the ground is supported by iron pillars which reach upwards to the roof. The whole middle part of the roof is of glass, and its curved sides over the gallery are beautifully arched and moulded, the corner alcoves being a chief triumph of the architect's skill.

The front of the gallery is handsomely constructed of pitch-pine, carved and panelled. The general colour of the interior is cream,

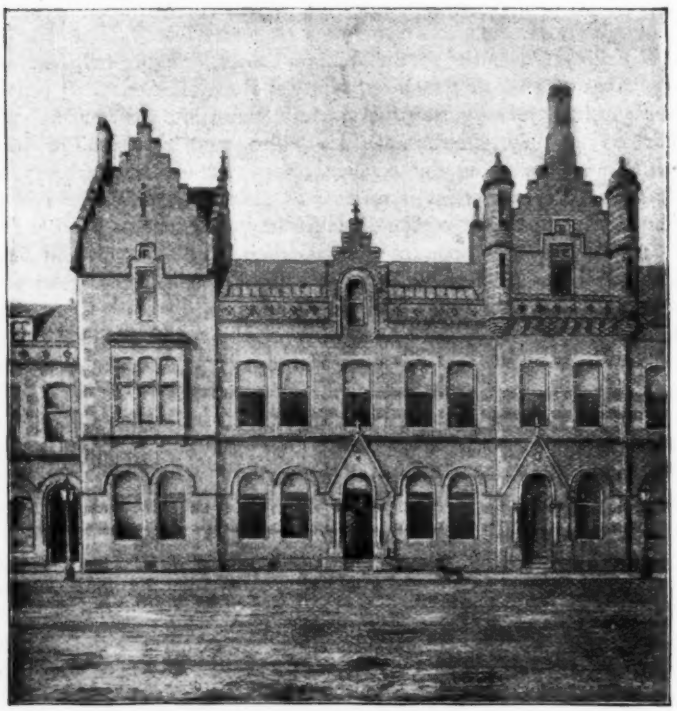

FIG. 1.—EXTERIOR OF THE PERTH MUSEUM.

relieved with gold, and the interior of the cases is painted a pale greyish blue. The wall-space above the wall-cases and below the gallery is occupied by geological diagrams of sections across the county, from designs by Mr. Henry Coates. These sections show four representative traverses across different parts of the county; they are drawn to scale, and the colouring is that of the Geological Survey sheets.

The sketch (Fig. 2) shows the ground-plan of the floor of the Museum. The range of wall-cases A A A extends round the four walls. These cases are 7 feet 6 inches high, with a 9-inch base-board.

and are 1 foot 10 inches deep. They are constructed of the best Tabasco mahogany; each door is 3 feet 3 inches wide, and of plate-glass in one whole sheet; there are no locks, but each door is screwed home to a stop covered with silk velvet, by means of seven square-threaded screws.

The local birds occupy these cases, along three of the four walls. They are arranged on plate-glass shelves, the shelves in turn being supported on T-irons fitted into studded iron plates. Thanks largely to the labours of Colonel Drummond-Hay, of Seggieden, this department is well-nigh complete. With very few exceptions, we possess a specimen of every bird recorded from the district, and in nearly all

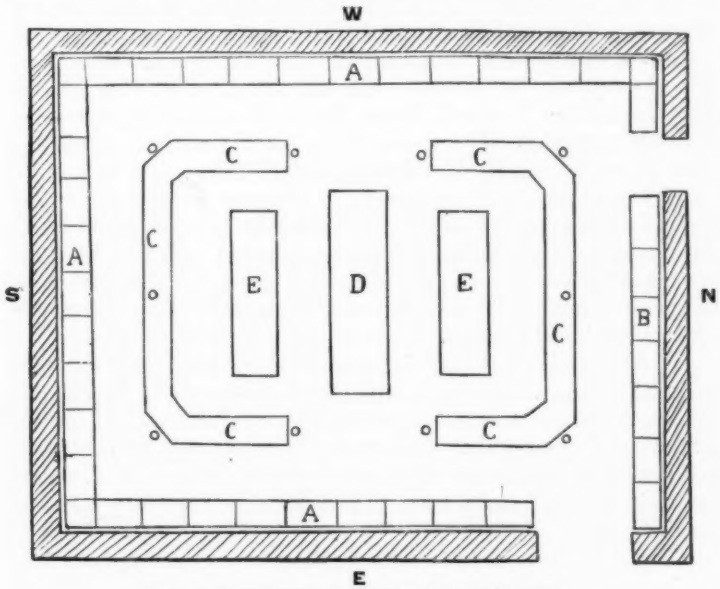

FIG. 2.—GROUND-PLAN OF THE PERTH MUSEUM.

instances they are well-stuffed, and the attitudes are good. Among the chief treasures of this local collection are the Black-throated Thrush, Grasshopper Warbler, Great Grey Shrike, Waxwing, Hawfinch, Rose-coloured Pastor, Great Spotted and Green Woodpeckers, Hoopoe; Osprey, Gyr-Falcon, a particularly fine series of Golden Eagles in different stages of plumage, and a very fine series of Peregrine Falcons; a good series of Ruddy Shelldrakes, a pair of Smews, which are extremely rare with us; a series of Ptarmigan showing seasonal changes for every two months from January to November; Pallas' Sand Grouse; Spotted Crake, Black-tailed Godwit, Bittern, Green Sandpiper, Pomatorhine Skua, Little Auk, Red-necked Grebe, and Eared Grebe.

The cases along the remaining wall are destined to contain the

local fishes, amphibians, and reptiles. The newer preparations of fishes are mounted in a four per cent. solution of formalin, and, whether this method prove in the course of time to be permanent or no, there can be no doubt so far as to the extreme beauty of specimens so preserved. A large number of the fishes, including some fine salmon, are represented by coloured casts. The collection does not at present include the marine fishes of the estuary of the Tay and neighbouring coasts, but merely the fresh-water fishes of the rivers and lochs of Perthshire.

Two large cases (C C), forming an inner circle to the room, are occupied by the nests and eggs of local birds. Without aiming at the costly but beautiful arrangement adopted in the Natural History Museum at Cromwell Road, an effort is made in many cases to show the nests with their natural surroundings. Among the rarer local birds, we have, for instance, the Chiff-chaff, Goldfinch, Greenshank, Shoveller, Pochard, Tufted Duck, Goosander, Red-breasted Merganser, Osprey. The smaller nests are sufficiently displayed by being raised on neat blackened wire stands.

The great case (D) in the centre of the room contains a stag and hind of the red deer, the latter presented by His Grace the Duke of Atholl, the stag from the Marquis of Breadalbane; together with them are mounted a buck and doe of the roe-deer, the gift of Colonel Campbell. The specimens are beautifully stuffed and tread a mimic moor of heath and bracken.

The remaining cases (E E) contain the rest of the Perthshire mammalian fauna. Among the rarer forms are the wild cat and the marten, the former now nearly extinct in the county, the latter unseen for the last sixteen years. To the common river seal, *Phoca vitulina*, we have lately added a beautiful specimen of the harp seal, *P. Greenlandica*, in splendid piebald coat, taken during last summer in Invergowrie Bay.

Two sides of the wall-cases of the gallery are occupied by botanical specimens. The first shows one or more representative species, dried and mounted, of all the genera of phanerogams that occur in Perthshire.

The long wall-case on the west side is devoted to Perthshire trees, and is one of the chief features of the Museum. In successive panels there are polished longitudinal and transverse sections of the trunks of large and sometimes stately examples of our indigenous trees; and together with these are, in each case, preparations illustrating the seed, seedling, leaf, flower, fruit. The seedling, flower, and fruit are wet preparations in two per cent. solution of formalin. Above all are placed photographs taken from representative specimens of living trees under summer and winter conditions. Most of the polished logs are the gift of the Duke of Atholl.

The table-cases in front of these show specimens of the ferns and mosses of Perthshire, systematically arranged.

The south wall of the gallery contains as yet but a portion of the Society's collections of local insects. These are arranged in large, close-fitting boxes, topped with clear glass, and framed within steeply sloping exhibition cases. A portion of the Lepidoptera and a portion of the Hemiptera, the work respectively of Mr. S. T. Ellison, honorary secretary of the Society, and Mr. T. M. Macgregor, F.E.S., are all the insect collections that are as yet displayed.

The remaining wall-case contains an extensive series of local rocks, and has been arranged for the Society by Messrs. H. Coates and P. Macnair. This case contains, besides a very full collection of the rocks, minerals, and fossils of the district, series showing rock-structures and the formation of soils from the local rocks.

Desk-cases are arranged round the gallery, and contain, from the north-west corner to the south and along the south wall, our fungi, algæ, lichens, mosses, and ferns.

While the main hall of the Museum, as so far described, is destined to illustrate in the fullest possible way the natural history, botany, and geology of our great county, a smaller hall, that was once the Society's main museum, is now about to be devoted to the exhibition of an index-collection. The Society hopes to show in this index-collection, as far as possible after the model and example of the newer index-collections in the British Museum and elsewhere, teaching preparations illustrative of zoological classification of various anatomical and morphological features, of theories of descent, of phenomena of natural and sexual selection, of principles of distribution, of organisms useful or injurious to man. The task of framing these collections, morphological, biological, or industrial, may be a long and costly one; but the Society aspires to make them, in course of time, not unworthy to take rank beside the rich collections of the local fauna and flora that its members and friends have already brought together.

The Society's collection of plants is also divided into a local herbarium, illustrative of the flora of the county, and a general one, which consists mainly of the collection of European plants formed by the late Dr. Buchanan White and presented by him to the Society. The Perthshire herbarium consists largely of plants collected by him, also by Col. Drummond-Hay, Messrs. W. Barclay, J. Coates, R. H. Meldrum, C. McIntosh, and other botanical members of the Society. It forms the foundation on which Dr. Buchanan White built up the chief work of his life, "The Flora of Perthshire," which is to be published shortly under the editorship of Professor Traill. A special feature of this herbarium is Dr. White's own collections of Perthshire willows, named and mounted by himself, and intended to illustrate his important paper on that difficult genus, published in the *Transactions* of the Society.

ALEX. M. RODGER.

The Museum, Perth.

SOME NEW BOOKS.

Books on Birds.

The Fauna of British India. Birds. Vol. III. By W. T. Blanford. 8vo. Pp. xii., 450. London: Taylor & Francis, 1895.

The Royal Natural History. Edited by R. Lydekker, B.A., F.R.S. Sections VI. and VII., Birds. Pp. 1—288 and 289—580. London: Warne & Co., 1895.

Allen's Naturalist's Library. Edited by Dr. R. Bowdler Sharpe, LL.D., F.L.S. A Handbook to the Birds of Great Britain. By R. Bowdler Sharpe. Vol. II. 8vo. Pp. xviii., 308, plates xxxii.—lviii. Price 6s. A Handbook to the Game Birds. By W. R. Ogilvie Grant. Vol. I. 8vo. Pp. xv., 304, with 21 plates. Price 6s. London: W. H. Allen & Co., 1895.

The Structure and Life of Birds. By F. W. Headley, M.A., F.Z.S. 8vo. Pp. xx., 412, 78 figs. London: Macmillan & Co., 1895. Price 7s. 6d.

Birdcraft, a Field Book of Two Hundred Song, Game, and Water Birds. By Mabel Osgood Wright. 8vo. Pp. 317, xvi., with 15 plates. London: Macmillan and Co., 1895. Price 12s. 6d. nett.

Les Oiseaux de Parcs et de Faisanderies. Par Rémy Saint-Loup. Demy 8vo. Pp. viii., 354, with 48 figs. Paris: Baillière, 1895. Price 3fr. 50.

Traité de Zootechnie Speciale: Les Oiseaux de Basse-Cour. Par G. Cornevin, 8vo. Pp. x., 322. 4 coloured plates. Paris: Baillière.

Hawks and Owls from the Standpoint of the Farmer. By A. K. Fisher, M.D. Pp. 215—232.

Bulletin No. 7. Preliminary Report on the Food of Woodpeckers. By F. E. L. Beal. The Tongues of Woodpeckers. By F. A. Lucas. 8vo. Pp. 39.

The Crow Blackbirds and their Food. By F. E. L. Beal. Pp. 233—248.

Bulletin No. 6. The Common Crow of the United States. By Walter B. Barrows and E. A. Schwarz. Pp. 1-98.

U. S. Dept. Agriculture, Washington, 1895.

Our office table has, during the past month or two, become absolutely covered by books and papers and pamphlets dealing with various branches of ornithology. A few of the more important or more ambitious of these works, such as Gaetke's "Birds of Heligoland," and Dixon's "Migration of British Birds," we have already reviewed; but there remains a large number of works which considerations of space force us to deal with more shortly.

Among systematic works we have the third volume of "Birds" in the "Fauna of British India." The first two volumes of the "Aves" of this admirable series were so remarkable for their general excellence, that when Mr. Oates was unexpectedly compelled to return to his duties in Burma, we regarded the completion of the work with feelings of dismay. Happily, the editor of this series,

W. T. Blanford, has himself an enviable knowledge of Indian birds, and he has gallantly stepped into the breach. Indian students ought to be very grateful to Dr. Blanford for the amount of hard work which he has obviously bestowed upon the book before us. The rectification of synonyms must, in itself, have occupied a great deal of time, and to most of us the tracking out of the priorities of names is a wearisome duty. Mr. Oates had only time, if we recollect aright, to deal with the Indian Passeres. His successor has devoted the third volume of this series to the Broadbills, Woodpeckers, Rollers, Kingfishers, Hornbills, Swifts, Nightjars, Trogons, Cuckoos, Parrots, Owls, and Accipitrine birds. In dealing with these, Dr. Blanford has scored a very conspicuous success. Of course, there will always be some difference of opinion as to the employment of certain generic or specific names, and the day of a hard and fast uniformity among specialists will not come in a hurry. But the definitions of the structural characters of the Families and Genera adopted by the author are explained with praiseworthy lucidity, and are in complete harmony with the present state of our knowledge of avian morphology. The descriptions of plumage are also judicious, and cannot fail to enable any young sportsman to identify the birds that he may come across on his shooting expeditions. When we remember that Jerdon is scarce, and costs a five-pound note, while its letterpress though good is antiquated, we cannot disguise our satisfaction that a trustworthy handbook is now available at a reasonable price. The cuts of the heads of birds scattered up and down the book add to its interest in the eyes of the student. Though any undue haste would militate against the quality of the fourth volume, we shall be pleased to see so admirable a work safely brought to its anchorage.

Turning to works of a more popular nature, it is satisfactory to notice the progress which the Royal Natural History continues to make under the very competent hands of R. Lydekker. The ornithological sections are before us, and the standard of the earlier portions of the work appears to be maintained. The reading public are exacting nowadays, and expect a great deal for their money. Messrs. Warne & Co. deserve some credit for their enterprise, since the type is uniformly good, and the work of the printer leaves little or nothing to be desired. The illustrations are excellent, taken as a whole, but one or two are exceedingly bad. We cannot understand how the editor could allow the insertion of the effigy of a so-called bullfinch which appears at p. 400. Indeed, that of the brambling is little, if at all, more creditable than its companion. But these sorrowful exceptions only serve to enhance the general merit of the larger number of the numerous figures, and those by Wolf and G. E. Lodge are genuine works of art. Lodge is seen at his best in the engraving of an adult goshawk inserted at p. 240. The conception of a golden eagle's eyrie shown on p. 224 is a fine specimen of a great master's style. The important order of the Passeres was assigned to the Rev. H. A. Macpherson, that of the Picariæ was apportioned to Dr. Sharpe, while the editor himself contributes the remaining part of the seventh section. It is rather amazing that Mr. Lydekker should seriously cite an avowedly *anonymous* correspondent of the *Times* upon the habits of the merlin. With this exception, the quotations appear to be judiciously selected and carefully welded together. A fair amount of original information regarding the habits of birds is also forthcoming. On the whole, perhaps the most satisfactory feature of the avian portion of this work is the care which has obviously been bestowed upon explaining, in simple but accurate

language, the most important points in the structure of birds. This is as it should be, and we wish all success to the completion of the work.

From Messrs. Warne we pass to Messrs. Allen, of whose Naturalist's Library we have two volumes before us. The publishers of this meritorious series of popular handbooks have been singularly fortunate in securing the assistance of members of the British Museum staff, who possess in an eminent degree the proper qualifications for elaborating the subjects apportioned to their individual share. In fact, a marked improvement in books on birds generally is the trouble that experts of the first rank, like Dr. Sharpe, are willing to expend in convincing gainsayers that birds should be regarded as exhibiting a great variety of structure, and that consequently they ought to be made the subject of much thoughtful study. It is not enough that the ornithological student should be a field observer. He ought also to have a competent acquaintance with the anatomy of birds, and be capable of giving a reason for the views which he holds on the general classification of the Class. In pursuance of this idea, Dr. Sharpe devotes a fairly large share of the space at his disposal, in the present volume, to stating with admirable lucidity and circumspection such details regarding the structure of different genera of British birds as a young and intelligent student may be expected to assimilate easily. Another praiseworthy feature is the amount of information given as to the range of so-called "British" birds outside the limits of our islands. The attention devoted to this point is calculated to broaden the views of the reader, and to banish any insular prejudices which he might otherwise retain. Dr. Sharpe treats in the present volume of a variety of birds, from owls to woodpeckers; but the birds of prey (as regards which Dr. Sharpe has long been our first authority) seem to form its major part. We should add that Dr. Sharpe has enjoyed the privilege of consulting the notes on *Anatidæ* of Count Salvadori, who is at present engaged upon the twenty-seventh volume of the "British Museum Catalogue." He has therefore been able, in a marked degree, to take advantage of the researches of his distinguished colleague. We trust that Dr. Sharpe may be able to give us the third and fourth volumes of his British birds in the course of next year.

Ogilvie-Grant has already contributed many papers on game birds to the *Ibis*. He has also found time to write a British Museum Catalogue of game-birds, which is in all respects a model of what such a catalogue ought to be. On the present occasion he treats the subject in a fresh and graphic style, which will be sure to commend itself to all the sportsmen and lovers of wild nature who may have the good fortune to read his new work. Primary importance seems to be attached to the descriptions of plumage, especially as regards the differences between the sexes, which are often puzzling when the student is dealing with plain-coloured birds. Thus, a full-page plate is furnished to illustrate the external differences which Mr. Grant has discovered to distinguish the male and female of the common partridge. Similarly, the admirable coloured plates which recently appeared in the *Annals of Scottish Natural History*, intended to explain the author's researches into the changes of plumage of the red grouse, are here introduced to a wider number of readers. They should be useful in advancing still further our knowledge of the distribution of the various types of that most varying species. But it must not be supposed that our author confines his attention to the dry and technical details of plumage which experts look for. On the

contrary, he has taken the trouble to condense into his text a great many facts about the wild habits of birds, and, in so doing, he has exercised a wise discretion. As a result, he has produced a volume which is sure to find its place on the bookshelf of every traveller and of most country gentlemen.

Mr. Headley is one of the numerous people who are neither naturalists nor anatomists by profession, but who have given a great deal of time and pains to the special subject of birds. A long chapter on flight is the most important part of his book. He gives a careful account of the bones and muscles involved, and discusses the mechanics of flight from the simple beginning of the systems of levers involved to the obscurer questions of the resistance of the air to so complicated a surface as the avian wing. He betrays, perhaps, too great a tendency to lecture the world in general on its stupidity; no one with the most elementary knowledge of physics supposes that the air-sacs and hollow bones of birds have a ballooning effect. As a matter of fact, Kohlrausch in 1832 published a treatise at Goettingen entitled "De Avium Saccorum Aëriorum Utilitate," and set the matter at rest, at least for all anatomists. But we remember that Gaetke, in his "Birds of Heligoland," betrayed a weakness for the view Mr. Headley is so eager to contradict; and Mr. Headley, perhaps knowing the weaknesses of the field-ornithologist better than the present reviewer, had reason to set him right. In addition to his interesting chapter on flight, Mr. Headley has written a large number of short elementary chapters on embryology, palæontology, physiology, and so forth. These are pertinently illustrated, and no doubt will interest the amateurs for whom they are written.

Not unlike Dr. Bowdler Sharpe's excellent series on British Birds is a charming little book by Mabel Wright, brimful of information about the birds of America. "The two hundred birds chosen for description from . . . over nine hundred species of North American Birds are selected as being those which will be the most likely to interest bird-lovers." Of the four introductory chapters—The Spring Song, The Building of the Nest, The Water Birds, Birds of Autumn and Winter—it would be hard to speak too highly; they are so charmingly written. The rest of the book is admirably arranged from the point of view of the non-technical reader. First, we have a few remarks on "How to Name the Birds," then a "Synopsis of Bird Families," then follow "Bird Biographies," and lastly a "Key to the Birds." The biographies give in a concise form such details as length, coloration of the sexes, song, nest and eggs, range, and so on; this is completed by remarks of a more general character.

One of the most difficult tasks that confronts the field-ornithologist is that of coining an intelligible description of the songs and call-notes of the birds he encounters, and often, in a wild burst of despair at the barrenness of his efforts, he leaves us the information that the note is "metallic" or "silvery"! The authoress is sometimes very happy in her *rôle* of interpreter, but occasionally the task proves too much even for her trained ear, and she falls back on the poets, and not always, as we venture to think, with like success. For instance, we are told that the song of the Hermit Thrush, is "flute-like ascending." It has been set to words by Burroughs, and runs thus—

"O spheral, spheral! O holy, holy! O clear away, clear away! O clear up, clear up!"

In speaking of the enemies of birds, we read that "man is . . . the most relentless of all. The other enemies kill for food only, man kills for food casually, for decorative feathers wantonly, and for

scientific research plausibly, . . . are not the lives of hundreds of song-birds a high price for the gain of a doubtful new species, which only causes endless discussion as to whether it really is a species or merely a freak?" We take exception to the third of these objections. Surely those who make scientific research a cloak to conceal, or rather justify, what is really wantonness, are the exception, not the rule. The charge of shooting "hundreds of song-birds," etc., is obviously a random shaft. It is, we protest, unjust to suppose that

> Men have no place for fine-spun sentiment
> Who spend their lives 'mongst cabinets of skins.

Twice in the pages of this book the pernicious practice of spreading poisoned corn is advocated. Verily, the end cannot justify the means, even though that end be the destruction of crows. The numerous plates, mostly coloured, contain, each of them, several figures. Some of these are most life-like, and some are as bad as they can be. The book is beautifully printed, remarkably free from mistakes, and tastefully bound. Bird lovers should accord a warm welcome to this little work, picturing to us, as it does, a country that we know not, and friends we have not seen.

Of more practical nature are the remaining books upon our list. Rémy Saint-Loup's pleasant but discursive little book has been compiled for popular purposes, its aim being to acquaint the general public with some useful particulars regarding the acclimatised birds to be met with in parks and zoological collections. The author starts with a discourse upon rheas and ostriches, from which he presently passes in order that he may describe certain species of swans which are often kept upon ornamental waters. By far the greater portion of the book is devoted to the consideration of game-birds, for which Saint-Loup exhibits a marked partiality. He does not appear to have a personal knowledge of the proper treatment of captive birds, though it may be that our author is too modest to favour us with the results of his own experience. But failing original information, he has acted judiciously in supplying copious extracts from the *Bulletin* of the Société d'Acclimatation and from other reliable sources. The result is that his pages are seasoned with salt, and will be read with a proper relish even by the initiated. For example, the curassows are easily domesticated, but are generally regarded as birds which never breed in captivity. Saint-Loup obligingly supplies us with interesting particulars of curassows nesting in France. Again, the young of blackgame (*Tetrao tetrix*) are proverbially difficult to rear artificially; Saint-Loup has collated all the particulars necessary to success. There can be no doubt that a fair-minded reader will find amusement and relaxation in assimilating the contents of this unpretentious manual. He may dissent from Saint-Loup's dictum that the pheasant (*Phasianus colchicus*?) is *monogamous*, and perhaps he will find a few faults; but on the whole he will admit that the book is a good one for unscientific readers.

G. Cornevin's "Birds of the Farmyard" completes "naturally and necessarily" a general work upon "Zootechnie" published some years since. The volume before us deals with the domesticated races of swans, geese, ducks, turkeys, and other farmyard fowls. The various birds are arranged into their respective groups, but these are the old-fashioned ones of Palmipedes, Cursores, etc. And in the definitions of the same there is no whisper of the ambiens or even of the schizognathous skull. The longest section of the book is naturally that devoted to the domestic fowl, of which there are many more

races than we had before suspected; these are divided for convenience into sections, subsections, categories, and subcategories. The divisions are, perhaps necessarily, of the pigeon-hole kind, and do not pretend to any particular naturalness; still they are useful enough in introducing order into what would be, without them, somewhat of a chaos. When the author has occasion to use an English expression it is apt to be a little Gallic in form; thus a well-known engraver and naturalist figures more than once, so it cannot be a misprint, as Becwik. The Polish Swan is inverted as the Swan Polish. These are, however, but trifling blemishes, to which no attention need be paid by any person who requires a work that is comprehensive and liberally illustrated.

The first of the pamphlets from the United States Department of Agriculture deals with the vexed question of the benefit and injury conferred on agriculturists by birds of prey. Dr. Fisher divides hawks and owls into four classes: (1) Species which are wholly beneficial; (2) Those chiefly beneficial; (3) Those in which the beneficial and harmful qualities about balance; (4) Harmful species. He then gives a brief epitome of the habits and food of certain well-known species, figuring Swainson's hawk (*Buteo swainsoni*), the red-tailed hawk (*Buteo borealis*), the American sparrowhawk (*Falco sparverius*), Cooper's hawk (*Accipiter cooperi*), and three species of owls. The most destructive hawks that the transatlantic farmer has to contend with are the sharp-shinned hawk and Cooper's hawk. It is interesting to learn that these two species have increased during recent winters about the large cities of the Eastern States in consequence of the abundance of the introduced sparrows, to which these hawks are partial.

The two reports on woodpeckers are published together, but the second is the more important of the two, in spite of its brevity. F. A. Lucas has only four pages to devote to his theme, and considering his difficulty, he has done well to tell us so much. He describes the tongues of about a score of species, and gives illustrations of the tongues of several species in extreme youth, as well as of those of fully mature birds. The facts are extremely suggestive, and deserve the careful consideration of ornithologists. Thus we are informed that in very young woodpeckers the tongue is unarmed at the point, bearing neither hairs nor spines, although the patch of minute points on the upper surface is present from the first. Later on, as indicated by a fully-fledged nestling of the downy woodpecker (*Dryobates pubescens*), a species whose tongue is armed in the adult with sharp barbs, the spines are represented by short reflexed hairs. It seems, therefore, that the lateral spines are acquired after the bird has commenced to fly, and that they must be developed very rapidly. Lucas takes leave of us with the significant remark that the evidence which he has been able to bring together favours the view that *modifications of the tongue are directly related to the character of the food*, and *are not of value for classification*. F. E. Beal has taken the trouble to examine the stomachs of no fewer than 679 woodpeckers, representing only seven species, all obtained in the Eastern States. It seems a pity that such a number of valuable birds should have been destroyed even for the purposes of this inquiry, for the results are precisely what any competent authority could safely have prophesied. However, the author deserves all credit for the immense trouble he has taken, and we hope that the results of his researches will diminish the ignorant persecution to which the woodpeckers and many other American birds are unfortunately subjected. Of the seven species into whose merits Mr. Beal

has inquired, it appears that the downy woodpecker is the most beneficial. At one time, as we know from the writings of the older American ornithologists such as Wilson, the red-headed woodpecker was habitually killed because it was accused of destroying great quantities of fruit. Mr. Beal has satisfied himself that the charge was enormously exaggerated. We hope that this report may induce the Department of Agriculture to take steps for the protection and encouragement of all the species of woodpeckers that are found in the United States.

From woodpeckers we pass to crows; Beal's little brochure deals with the common Purple Grackle (*Quiscalus quiscula*), and two subspecies, and is mainly concerned with the problem whether the benefits conferred on farmers by their services in destroying injurious insects outbalance the undoubted injury which they inflict on cereal crops. The additional charge against the grackle is that it destroys the nestlings of other birds, a charge which Mr. Beal considers to have been treated too seriously. He has satisfied himself that the food of the grackle for the whole year consists of animal and vegetable matter in nearly equal proportions. "Upon the whole, crow blackbirds are so useful that no general war of extermination should be waged against them. While it must be admitted that at times they injure crops, such depredations can usually be prevented. On the other hand, by destroying insects they do incalculable good." We commend these remarks to Miss Wright.

Corn is an important crop throughout the territory of the United States, and in many States the area devoted to it exceeds the combined areas of all other cereals. It was, therefore, highly appropriate that an enquiry should be made as to whether the popular opinion that the crow is highly injurious to agricultural interests, since "it devours corn under all circumstances," is or is not well founded. Mr. Barrows devotes the second, third, and fourth chapters of his pamphlet to reviewing the animal food, insect food, and vegetable food discovered in the stomachs of more than 900 crows, and arrives at the conclusion that the vegetable food of the crow amounts to about 57 per cent. of the whole food. Of this, corn is of most importance, but the crow feeds also on acorns, mast, and many other wild fruits. The insects found in the stomachs of the crows in question have been, as far as possible, identified by Mr. Schwarz, who has done his best to decide whether the insects so consumed were injurious or the reverse. In the course of the examination of the food of the 900 crows, many curious facts have come to light, as, for example, the destruction by crows of great quantities of frogs and toads. The Report is eminently worthy of the thoughtful consideration of all who are in any way interested in the Corvidæ, or in the relations of birds to modern agriculture. Much credit is due to the authors of this essay for the clear and lucid way in which they have marshalled together a wide array of facts.

The North Sea Fisheries.

An Examination of the Present State of the Grimsby Trawl Fishery, with special reference to the destruction of immature fish. By Ernest W. L. Holt. Journal of the Marine Biological Association, n.s., vol. iii, pp. 337–448 and chart. Plymouth, 1895. Price 3s. 6d.

This is an essay of over 100 pages on the North Sea Fisheries and their prospects, which occupies a whole number of the *M. B. A. Journal*, and is certainly one of the most important contributions that has yet been made by the professional zoologist to the discussion of practical

fishery problems. Facts and statistics (by no means two names for the same thing) in regard to our sea fisheries are usually exceedingly dry reading, but Mr. Ernest Holt has managed, not only to invest his subject with interest, but even in places to make it amusing. His caustic humour breaks out every here and there, as, for example, where he reminds us that "a Conference is usually prolific only to the third generation. It begets a Resolution, the offspring of which adhering to the strictly discontinuous type of Variation, is a Deputation. A deputation has been described as a 'noun of multitude, which signifies many but does not signify much'; and the unanimity with which the sufficiency of this definition is accepted by those in office, of whatever shade of politics, is alone sufficient to prove that 'great minds think alike.'" And, again, when he illustrates the relative merits (*sic*!) of the in-shore and deep-sea fisherman in destroying small fish, by a reference to the Walrus and the Carpenter in "Alice through the Looking Glass," where one ate more oysters than the other, but the other ate as many as he could get! "However," says Mr. Holt, "if the assembled wisdom of Parliament chooses to consider that its business is rather to settle the squabbles of rival classes of fishermen than to take measures to increase the fish supply, one can but regret it." One of the sections of the report gives an interesting account of a twelve days' voyage in a steam trawler from Grimsby, which we can, from our experience of the similar vessels on the other side of the country, commend as giving an excellent life-like sketch of the personal peculiarities, habits, and conversation of these rough and ready mariners who sweep our sea-bottoms from Iceland to the Bay of Biscay, and who perpetuate in this degenerate age the enterprise and hardihood, along, perhaps, with other virtues and vices, of the Viking and the buccaneer.

The history of trawling in our seas has been a history of the discovery, and the destruction, one after another, of fresh fishing grounds; and it is interesting, as showing the extent of the evil, that the present agitation and demand for fishery regulation and supervision differs from all other known fishery grievances in that the complaints of the trawlers are directed, not against some other body of fishermen, but against their own practices. This agitation originated at Grimsby and Hull, and, consequently, Mr. Holt has been stationed at Grimsby for the last three years by the Marine Biological Association, in order that he might collect information as to the alleged destruction of immature fish in the North Sea by beam trawling, and as to the resulting effect upon the fisheries.

Mr. Holt has now given us a very fair statement of his methods, his material, his evidence, and his conclusions, which must, we think, carry conviction to any unbiassed mind that large numbers of immature fish are destroyed by trawling, and that the supply of the more valuable trawl fish in the North Sea is in consequence diminishing. It is no easy matter to get reliable fishery statistics, and to handle them properly. We are told that "It appears to be the peculiar function of the fisheries department of the Board of Trade to formulate statistics which shall be just sufficiently complete to bring into strong relief the importance of what is omitted from them"; and in comparing quantities or values of successive years or decades, the increase in numbers and efficiency of boats and gear, and the great extension of the area fished, have all to be taken into account. Steam and petroleum engines, ice-room, and fish-well, and lastly the new otter-trawl—which, although Mr. Holt does not know it among English trawlers, is now being used at Liverpool—are all improvements which

have made such changes in the conditions of the fishery that it is a risky matter to draw definite conclusions from the numerical statements at our disposal. The difficulty of dealing with fishery "returns" is still further increased by the want of discrimination between various species, and by the fact that a fish may came into port as a codling and go out as a "Finnon haddock," may "be caught as the head of a catfish and the tail of a monk, and go out as the cheek muscles of a skate."

Mr. Holt's special attention was directed to the question of immaturity in the fish caught, and he chose out the skipper with whom he made his voyage because he had the reputation of having landed more undersized plaice than any other man in the world. It is pleasing to see that, like the true naturalist he is, Holt soon was on the best of terms with the whole ship's company. We read "by this time I had got to work with tow-nets and microscope, and the antics of copepods and such small deer were a source of constant delight to the crew . . . I was able also to introduce my friends to the mystery of artificially fertilising fish eggs, and had hatched out a small family of turbot in a pickle bottle before we got back to port." All this and much else is very pleasing (weather notwithstanding); but there is another and very appalling side to such voyages. The modern steam trawler is a terrible engine of destruction, and we find that on a moderate estimate "in a whole year's trawling, on all North Sea grounds, 57 per cent., or more than half, of the fish caught had never had a chance of reproducing their species, and so contributing to the upkeep of the supply."

In conclusion, Holt attributes the grave deterioration in the North Sea trawling industry to two causes, "(1) an immense destruction by deep-sea trawling of immature plaice and turbot on shallow grounds on the Continental coast, frequented only by immature members of the first species, and chiefly by immature members of the last; visited also by spawning soles, turbot, and brill; (2) a serious destruction on our own coast by various methods of long-shore shrimping of immature plaice, and of immature soles, turbot, and brill, in proportion to the abundance of these species," and so on. For the full details of the amount of blame attaching to the various methods of fishing, reference must be made to the report, which includes, last of all, a discussion of proposed remedial measures. Whether or not we all agree with the author in his arguments as to the benefit or the reverse likely to result from various methods, restrictive and otherwise, his carefully thought out conclusions must carry great weight, and must receive the utmost consideration from the District Fishery Committees and other legislative boards. His most important contention is that by the mere imposition of a size limit of thirteen inches on plaice alone, from March 14 to September 30, we should leave the eastern grounds entirely untouched to serve as a nursery for the whole North Sea for plaice, turbot, and to a less extent for brill and soles, and as a spawning haven for soles, brill, and turbot. This appears to be the only practicable method, at present, of checking the depletion of the North Sea grounds and of enabling the fish supply to recover.

It is deeply to be regretted, in the interests both of science and of the fisheries, that Mr. Holt has been compelled by ill health to give up his important work at Grimsby, and to resign his post as naturalist to the Marine Biological Association. Let us hope that he may soon be enabled to return to his labours with regained strength and fresh vigour. W. A. H.

CATALOGUE OF THE MARINE MOLLUSKS OF JAPAN, with descriptions of new species and notes on others collected by F. Stearns. By H. A. Pilsbry. 8vo. Pp. viii., 196, with 11 plates. Detroit: 1895. Price, paper, $1; cloth, $1.50.

JAPAN, like Africa, not only largely attracts public attention just now, but also may be said always to furnish something new. Certainly its molluscan fauna seems far from being worked out, if one may judge from the results obtained by Mr. F. Stearns (who must not be confused, by the bye, with Dr. R. E. C. Stearns, the conchologist) during two visits of some duration to that fascinating region. This traveller was not content with the casual specimens collected by himself or procurable in the markets, but employed an intelligent Japanese fisherman, Morita Seto by name, to traverse the entire east coast and to visit the Loo Choo Islands on his behalf. The outcome has been eminently satisfactory, as evinced by the contents of the admirably got up volume before us, the publisher of which, moreover, is Mr. Stearns himself.

It is now thirteen years since the last list of the marine mollusca of Japan was issued by Dunker, so that a considerable addition to the number of known forms was to be expected: the present catalogue, however, contains about 500 species more than enumerated by Dunker, including forty believed to be new, and that although a considerable number of forms included by him have been sunk as synonyms or rejected from the Japanese list. In addition, very many individuals belonging to the families Rissoidæ, Eulimidæ, and Pyramidellidæ remain unidentified. Of these some are thought to be new, but "the literature of these groups," Mr. Pilsbry remarks, with more force of language than the occasion justifies, "has been so overloaded with Arthur Adams' descriptions which do not describe, that intelligent work upon the Japanese forms is impossible. The literature of descriptive zoology furnishes but few instances of work more superficial and worthless than that of this industrious dilettante."

The title of the work leaves much to be desired, for it gives no hint of the fact that the Brachiopoda are included; nor would the student of non-marine forms expect to find new species of Helices or other land mollusca. The concluding 34 pages, however, contain by way of appendix a "List of the Land and Freshwater Mollusks collected in Japan by F. Stearns," and a "List of Mollusca in the Collection of F. Stearns from the Middle Loo Choo Islands, with Descriptions of New Species." A very slight modification of the title-page would have obviated this inconvenience.

The classification employed is, we are told, "not entirely that of any one of the Manuals," which can readily be credited, for what self-respecting manual would venture to lump together three forms of Cyclophoridæ, a *Cyclotus* and a *Helicina*, to dub them "Operculata," in the same type as the surrounding family names, and plump them in between "Limnæidæ" and "Viviparidæ"? "The current generic nomenclature has been revised in certain cases," but not in others: why return to *Aspergillum* when *Brechites* has long been shown to have priority?

A truce, though, to these minor criticisms! The work is a most useful one, and will prove invaluable to future investigators of the Japanese molluscan fauna, whilst one cannot fail to be struck by the ability and energy of the man who, in the midst of curatorial duties and the heavy work of the Manual with which his name is so honourably connected, can find time to throw off, as it were, a volume of this importance. The plates, too, must be highly

commended, save the last, which, though clearly and well executed, is, in its style (line-process), in painful contrast to the rest. We commend them to the attention of the Malacological Society of London, whose *Proceedings* are apparently not always illustrated by artists who may be considered adepts in lithographic work.

A CAMBRIDGE MANUAL OF PETROLOGY.

PETROLOGY FOR STUDENTS. An introduction to the study of rocks under the microscope. By Alfred Harker, M.A., F.G.S. 8vo. Pp. viii., 306. Cambridge: University Press, 1895. Price 6s.

As the author remarks in his preface, there is room for a simple text-book of petrology for the use of elementary students. Something is wanted with more discussion of general problems than is to be found in Cole's "Practical Aids," and more detailed and less a catalogue of rock names than Hatch's "Petrology." The book that is really wanted is a Rutley's "Study of Rocks" brought up to date. Mr. Harker's book does not quite supply this, for he assumes more preliminary knowledge in his reader. He opens with a short introductory chapter referring to the use of the microscope, and the principal optical characters of simple application, such as colour, refractive index, extinction, and pleochroism. These subjects are briefly treated, and the student is referred for a systematic treatment of the subject elsewhere, and especially to Idding's translation of Rosenbusch. The principal part of the work consists of a description of the British rocks, grouped into the four divisions of plutonic, intrusive, volcanic, and sedimentary. The text bears throughout marks of sound knowledge and careful preparation. The descriptions of the rocks are clear, and as detailed as is necessary; all the principal variations from the main types are briefly referred to. The literature has been summarised very carefully, and the series of footnotes renders the book an index to British rocks. The section on the sedimentary rocks (chapters xvi.–xix., pp. 192–253) is more detailed than is usual in petrological works, and Mr. Harker is especially to be commended for his treatment of this interesting and neglected subject. The last three chapters are devoted to the problems of thermal and dynamic metamorphism, and to the description of various crystalline rocks which do not fit conveniently into either of the four classes.

The book has several strong recommendations: the descriptions are concise, the references to literature numerous and well-selected, and the facts accurate. It will, therefore, no doubt prove of great educational value. But in the absence of a glossary, the frequent use of technical terms, such as "phenocryst," before they are explained, must lessen its use to the solitary student. It has, however, apparently been written for students who are attending a university course or its equivalent, and to such it can be confidently recommended as a concise and reliable manual of British rocks.

A CAMBRIDGE MANUAL OF BOTANY.

THE ELEMENTS OF BOTANY. By Francis Darwin, M.A., M.B., F.R.S. Cambridge Natural Science Manuals. Pp. xvi., 235. Cambridge: University Press, 1895. Price 6s.

THIS book contains the substance of the botanical part of the course of lectures in Elementary Biology given to Cambridge medical students. But it is much more than this. It forms, without question, the best introduction to the study of botany in the language. The lines on

which the subject is treated are admirably adapted to build up gradually in the student's mind a harmonious conception of the plant-body and its activities. The style is characterised by perfect lucidity of description and exposition, combined with graceful phrasing and exceedingly apt, often picturesque, illustration. These qualities, indeed, unfortunately so rare in our elementary handbooks of science, form the chief and distinguished merit of the work.

We wish it were possible to praise the numerous figures with which the book is illustrated. Their cheap and common appearance is, of course, due to the style of reproduction adopted; but while those taken from Le Maôut and Decaisne are well chosen and useful, the ones drawn expressly for the book are often quite unworthy of it. What appears to be slovenly drawing is common, and actual inaccuracies are not altogether absent. Without going into details, we may draw attention to figs. 28, 38, 39, 40, 48, and 80, which are somewhat conspicuously open to one or other of these charges.

The weakest portion of the text is that devoted to anatomical description. The account of the cause of the characteristic appearance of the radial walls in the root endodermis (p. 42), and of the method of exit of a rootlet from its mother-root (p. 46), the statement that sieve-tubes contain "abundant protoplasm" (p. 58), and the omission of any reference to xylem parenchyma in the stem of *Helianthus*, are isolated instances of misleading or inaccurate description. There is no proper distinction drawn between primary and secondary medullary rays, and the statement that the rays of the seedling shoot "must still exist" in the thickened stem of the oak (p. 68) is quite misleading. The credit of "the most probable explanation" of the large size of spring vessels belongs to Haberlandt (*Physiol. Pflanzen Anatomie*, p. 371; 1884), rather than to Strasburger. The pits in the walls of the wood-fibres of the oak are distinctly bordered, not "simple oblique slits." The account of leaf-fall on pp. 106–7 is inaccurate. The "layer of separation" is quite distinct from the cork layer formed to heal the wound. The treatment of the pericycle is unsatisfactory: its existence in the stem is only recognised in a sort of grudging way, which cannot lead to the formation of clear ideas in the minds of students. The "bast fibres" are said, in a note on p. 62, to "have their origin in the pericycle." If "bast" is used as a synonym for phloem this is a contradiction, further emphasised in the Appendix, p. 206, last paragraph. If the pericycle is to be mentioned at all, it should be explicitly recognised as a separate morphological region, and a full description of its tissues should be given, with an admission of the difficulty (or impossibility) of delimiting it from the primary rays. But on p. 56 it is omitted from the divisions of the "ground tissue," where, if anywhere, it belongs; so that the pericycle becomes a sort of anatomical pariah, unrecognised alike by vascular and "ground" tissue. We have drawn attention to these defects because the great value of an anatomical training, however slight, lies precisely in the possibility of careful and accurate observation, description, and classification of tissue relations, and it is, therefore, of the utmost importance that students should be made to have absolutely clear ideas on anatomical questions: but, of course, these details form a very small part of an admirable book.

The Appendix forms a useful series of instructions for carrying out carefully-selected practical work.

NATURAL SCIENCE has before protested against the high price of these Cambridge manuals. Considering the style of reproduction of the figures, it ought to be possible to produce a book of these

dimensions for much less; and we are afraid that its expensiveness will act as a serious bar to that wide circulation in schools to which it is so well entitled, and which could not fail to influence most favourably the teaching of elementary botany throughout the country.

A. G. T.

AGRICULTURE: PRACTICAL AND SCIENTIFIC. By James Muir, M.R.A.C. Pp. xv., 343, with 49 tables in the text and 39 illustrations. London: Macmillan and Co., 1895. Price 4s. 6d.

THE first impression this well turned-out manual leaves on the mind is not unlike that which would be produced by the play of *Hamlet* with the character of the Prince of Denmark omitted. Its subject is agriculture and—as the title prominently sets forth—*practical* agriculture. If there is one feature more characteristic than another of the agriculture of these islands it is the intense degree in which the cultivation of the soil is bound up with, and essentially related to, the maintenance of live stock. But the reader will search this volume in vain for any information upon the meat- and milk- and wool-producing animals of the farm, or for any enlightenment as to that useful revival of recent years—horse-breeding. Had the book been called "The Soil and its Cultivation," or "Soils and Crops," it would have been correctly described, and the purchaser would not be misled by the use of a name which has a far wider signification than the author allots to it, though he must be well aware that agriculture embraces *Arvorum cultus pecorumque*.

The book comprises thirty chapters, some of them scanty and insufficient, others copious and well-filled. About fifty pages are devoted to the soil and its properties, followed by an equal space dealing with the various methods of amelioration and improvement. Next are five chapters, occupying some forty pages, in which are discussed natural and artificial manures and the principles of manuring; this section of the work is well executed. Implements and machinery are dismissed in the brief space of a dozen pages, and the remainder of the book—some 160 pages—is given up to the main crops of British agriculture, and it is here, perhaps, that we find the author at his best. He has quoted freely from the publications of the Royal Agricultural Society, and students will no doubt be glad to find placed at their disposal, in so condensed a form, the material thus selected. It is incorrect, by the way, to substitute *Achillea millefolia* for *Achillea Millefolium*, and *Centaurea cyana* for *Centaurea Cyanus*, but *Lychnis vespitina* is probably a printer's error.

Is the author right in his surmise that on irrigated grass-land a film of slimy material will form on the surface of the herbage if the water be allowed to run too long? If that be the case, why does not this film appear upon the ordinary submerged plants of our streams? It is much more probable that the film is due to stagnant water, a circumstance that came prominently under our notice in the great spring flood of 1882, when water-meadows were under stagnant water for two or three weeks. In the economy of water-meadows standing water is always feared, running water never.

FOR THE YOUNG.

AN INTRODUCTION TO THE STUDY OF ZOOLOGY. By B. Lindsay. 8vo. Pp. xix., 356, with 124 illustrations and diagrams. London: Swan Sonnenschein, 1895. Price 6s.

POPULAR HISTORY OF ANIMALS FOR YOUNG PEOPLE. By Henry Scherren, F.Z.S. Medium 8vo. Pp. vii., 384, with 13 coloured plates and numerous illustrations. London: Cassell & Co., 1895. Price 7s. 6d.

NATURE'S STORY. By H. Farquhar, B.D. 8vo. Pp. 191, illustrated. Edinburgh: Oliphant, Anderson & Ferrier, 1895. Price 2s. 6d.

POPULAR READINGS IN SCIENCE. By John Gall, M.A., LL.B., and David Robertson, M.A., LL.B., B.Sc. Second edition. 8vo. Pp. 467. Westminster: A Constable & Co., 1895. Price 4s.

THE number of popular books on science that are now being published is a sign of the times, and, whether the books be good or bad, we think that on the whole it is a good sign, since it shows, at all events, that a wider interest is being taken by all classes and all ages in the world around us.

We have so often been asked by people who have been attracted to zoology, to recommend them some book that shall put them in the way of studying it for themselves, and we have so often been unable to give them any satisfactory answer, that we are glad to meet with such a book as that by Miss Lindsay. There may be statements in it to which one can object, such as this, on p. 43:—"In the invertebrates, bones are not found, except in the case of the cuttlefish"; for the cuttlebone is no more a bone than is a cockleshell. Neither do we share the author's view, expressed on p. 170, that the pinnules of a crinoid are homologous with the tube-feet of a star-fish. But, despite such inaccuracies, and too great reliance upon names and terms instead of upon facts, the book is a useful one, and we ourselves, in our early attempts at zoological study, would have been only too glad for such chapters as those headed "Advice to Students." If the readers into whose hands this book may fall will honestly follow the advice of the author, they cannot be led very far astray by her enthusiastic ignorance. Besides an account of the chief books and of the way in which they may be used, Miss Lindsay refers to courses of lectures, to classes, to museums, and to biological stations, and she gives a list of the chief dealers from whom specimens or apparatus can be obtained. In short, the book will put a solitary student in the way of finding the answers to such questions as he is most likely to ask.

We doubt whether a Natural History for children has ever combined so much excellence of illustration with so much accuracy of matter as that which comes to us from Messrs. Cassell. As in most such books, the bulk of the work is devoted to back-boned animals, but the back-boneless ones are by no means neglected, and are treated in a thoroughly scientific, though none the less interesting, manner. Coloured plates are always attractive to young people, and those of the present volume are far superior to those usual in books of this kind. Our only objection to them is that they are made in Germany. "The author's aim has been to write in such fashion that the book may serve to waken, or quicken, interest in the observation of the habits of the lower animals, and as an introduction to the study of their relations to us and to each other"—and we think that the children, who, after all, are the ultimate critics, will prove that he has attained his end.

We hope that the children will not be quite so kind to Mr. Farquhar's little book, which consists of a number of "talks," written in that peculiarly irritating kiss-mammy style that is supposed to appeal to the minds of "the little ones." Although such science as is contained in this book seems correct enough, owing no doubt to the revision by Mr. Graham Kerr, it is interlarded with a wishy-washy and illogical theology which experience has long ago taught us does far more harm than good when those who have been crammed with it begin to think for themselves. Mr. Farquhar, who, we note,

is a bachelor of divinity, has, by his own account, a very intimate acquaintance with the thoughts and actions of "the Great Creator." Less presumption would have argued greater reverence.

The Popular Readings by Messrs. Gall and Robertson form a useful popular summary of the results obtained by investigators in various branches of science. The chapters on physical subjects are contributed by Mr. Gall, while Mr. Robertson is responsible for the astronomical, chemical, and biological sections. Neither author lays claim to originality; but the writings of the leaders of thought in each department have been used in compiling the various accounts, which are careful and accurate. Perhaps the amount of matter introduced into some of the chapters has led to excessive condensation; in fifty-eight pages we have, under the title of the "Vegetable Kingdom," an outline of the morphology, histology, physiology, and classification of plants, besides remarks on tropical vegetation and forestry. The chapter on "Mimicry" deals, not only with the phenomena which naturalists now understand by that term, but with the kindred phenomena of protective resemblance. The Darwinian theory is clearly enunciated, and some of the modern controversies thereon are mentioned. The author's respect for authority is shown to be rather too great by such a sentence as the following: "Considering that Huxley, who is a host in himself, substantially accepts the theory, there cannot be much doubt that natural selection is the chief factor in the evolutionary process." Huxley would have been the last to wish any man to come to an opinion about any subject by such a road as that.

THE FLOWERING PLANTS AND FERNS OF NEW SOUTH WALES. With especial reference to their economic value. By J. H. Maiden, F.L.S., assisted by W. S. Campbell, F.L.S. Part I., pp. 1–15, plates i.–iv. Sydney: 1895. Price 2s. 6d. (non-subscribers, 3s. 6d.).

THE Department of Mines and Agriculture of New South Wales is responsible for this brightly illustrated attempt to familiarise the colonists with the flora of their country. Each part of the work will, so far as possible, contain plates and descriptions of two forest trees of economic value, and of two flowering shrubs or smaller plants selected because of the beauty or scientific interest of their flowers or foliage. The trees selected for the first part are the Bloodwood (*Eucalyptus corymbosa*) and the Coast Myall (*Acacia glaucescens*), while the smaller plants, equally representative of the plant-life of the colony, are the Waratah (*Telopea speciosissima*) and the Flannel-flower (*Actinotus helianthi*). The last-named bears a strong superficial resemblance to Edelweiss, though a member of quite a different family (Umbelliferæ). The coloured plates are well executed and include sections of the flower and fruit, and other useful details. The text comprises a full botanical description (in brevier), and a good popular account of the plant, its parts, geographical distribution, and economic value, with notes on cultivation. The specimen promises well, and we echo the hope expressed in the introduction that the public will support it sufficiently to justify its continuance. Half-a-crown per part is not an exorbitant price, if the standard of excellence of the plates in the present issue be maintained.

MICROSCOPICAL STUDIES IN BOTANY. By James Hornell, Director of the Jersey Biological Station. With original photomicrographs of the subjects described. Vol. i., Pt. I., May, 1895. 8vo. Pp. 8, 3 plates. Jersey: Author. London: Elliot Stock. Price 2s.

THE little pamphlet to hand speaks well for the series of botanical slides which Mr. Hornell is issuing along with the illustrative text and

original photomicrographs. This first instalment includes four "studies": No. 1, the flower of *Clematis japonica*, illustrated by longitudinal and transverse sections through flower-buds; No. 2, the Dandelion, as typical of composite flowers, with similar sections through the capitulum; No. 3, the anthers of *Eschscholtzia*, with a transverse section through the flower-bud; and No. 4, the fruit of the fig, with a longitudinal section through a portion of a young fig. We have not seen the preparations, but the photos are good and bear examination under a lens, and the explanatory letterpress is well arranged and accurate. Busy teachers as well as students should find this series helpful, and the price, 21s. per annum (8s. without the preparations), is not exorbitant.

New Serials.

Under the title *Quarterly Notes*, the Geological Survey of India has begun a new publication in folio. The three numbers received consist of statements of the work accomplished during the quarters ending January 31, April 30, and July 31, 1895. We had heard of some difficulty as to the publication of further palæontological results, so we are the more glad to learn that series xvi. of *Palæontologia Indica*, consisting of reports by Fritz Noetling on the Jurassic and Cretaceous faunas of Baluchistan, is now in the press. The price of *Quarterly Notes* is not stated, nor is there any indication of the true date of publication.

The Geological Survey of Mexico have started a *Boletin de la Comision Geologica de Mexico*. No. 1 contains 55 pages and 24 plates, and discusses the mesozoic fossils of the Sierra de Catorce in San Luis Potosi.

Messrs. Juta, of Cape Town, announce the *Scientific African*, a monthly journal of South African science, arts, and crafts, price 6d. The November number, which was the first published, contained an account of the Geological Survey of Cape Colony. In the December number we note a portrait and account of Mr. A. Geddes Bain, the discoverer of the wonderful fossil reptiles from South Africa.

Terrestrial Magnetism, edited by Dr. L. A. Bauer, of the University of Chicago, is a new quarterly announced for this month.

Archiv für Anthropologie und Geologie Schleswig-Holsteins und der benachbarten Gebiete, 8vo, published by Lipsius and Tischer, in Kiel and Leipzig, and edited, for anthropology, by Miss J. Mestorf, Director of the Museum of Antiquities in Kiel, and, for geology, by Professor H. Haas, of Kiel. The first part, price 4s., contains the beginning of a long paper by E. Stolley, on the Cambrian and Silurian drift of Schleswig-Holstein and its brachiopod fauna.

Two important bibliographical works were begun in 1895. First, *Bibliographie des Travaux Scientifiques publiées par les Sociétés savantes de la France*, 4to (Paris, E. Leroux, rue Bonaparte 28); price 5 francs for a livraison of 200 pages; it is compiled by Dr. J. Deniker, under the auspices of the minister for public instruction, and contains a list of the contents of all publications of French societies, so far as such contents are of scientific nature. Secondly, *Bibliotheca Geographica*, published by the Gesellschaft für Erdkunde in Berlin, and containing the list of current publications previously printed in the society's *Zeitschrift*. The first volume, edited by O. Baschin, with the assistance of Dr. E. Wagner, catalogues the geographical literature of 1891 and 1892. Here, too, should be noticed the *Bulletin* of the newly founded Institut International de Bibliographie (8vo, Bruxelles, 10 francs per annum), which announces the preparation of a *Bibliographia Geologica*.

It may here be mentioned that the *Journal of Botany* is this year to be enlarged by an extra sixteen pages monthly, while the price of each number will be increased to 1s. 8d., and the annual subscription to 16s. It is hoped that by this means the *Journal* may be able to publish a large number of papers on Cryptogams, which no longer have *Grevillea* to go to, and to conclude Mr. W. A. Clarke's "First Record of British Plants."

It is also to be noted that *Knowledge* is with this year enlarging its scope to include literature and art.

Our Editorial Note headed "Erratics" had gone to press when we received notice that *The Glacialists' Magazine* had changed from a monthly to a quarterly, with an annual subscription of 6s. Parts 1 and 2 of volume iii., dated June and September, 1895, were issued in December of that year. Four misdatings *per annum* is better than twelve; may we hope for even further improvement?

LITERATURE RECEIVED.

IN addition to the books herein reviewed, we have received:—

Embryology of the Invertebrates, Korschelt and Heider, translated by E. L. Mark and W. M. Woodworth; Climates of the Geological Past, E. Dubois; Nature *versus* Natural Selection, C. C. Coe: Sonnenschein. Open-Air Studies, G. A. J. Cole: Griffin. Milk, C. M. Aitman; Introduction to the Study of Fungi, M. C. Cooke: Black. Fishes Living and Fossil, B. Dean; The Structure of Man, R. Wiedersheim, translated by H. and M. Bernard; Handbook of British Lepidoptera, E. Meyrick; Mosses and Ferns. D. H. Campbell; Natural History of Eristalis tenax, G. B. Buckton; Peripatus, Myriapods, and Insects, A. Sedgwick, F. G. Sinclair, and D. Sharp: Macmillan. Africa, vol. ii., South Africa. A. H. Keane: Stanford. Catalogue of the Spiders of Burma, T. Thorell: Brit. Museum (Nat. Hist.). The Growth of the Brain, H. H. Donaldson; Evolution in Art, A. C. Haddon: Walter Scott. Darwin and after Darwin, Professor Romanes: Longmans. The Plants of the Bible, G. Henslow: Religious Tract Society. Nebular Theory, W. F. Stanley: Kegan Paul. Elementary Physiology, J. R. Ainsworth-Davis: Blackie. The Diseases of Personality, T. Ribot: Watts & Co. Monograph of the Land and Freshwater Mollusca, parts i. and ii., J. W. Taylor: Leeds, Taylor Bros. Studies in Biology, S. J. Hickson: Owens College, Manchester. Synoptical Flora of North America, A. Gray and S. Watson: Harvard Univ. Die Schöpfung des Menschen, W. Haacke: Costenoble. Manuel de Géographie Botanique, O. Drude, liv. 8, 9, 10; Flore de l'île de la Réunion, E. J. de Cordemoy: Paris, Klincksieck. Grundzüge der Paläontologie, K. A. von Zittel: Munich, Oldenbourg. Protobasidiomyceten, O. Möller; Die Artbildung und Verwandtschaft bei den Schmetterlingen, G. H. T. Eimer; Die Spiele der Thiere, Karl Groos; Neue Versuche zur Saison-Dimorphismus der Schmetterlinge, A. Weismann; Neue Gedanken zur Vererbungsfrage, A. Weismann; Grundzüge der Marinen Tiergeographie, A. E. Ortmann; Handbuch der Paläarktischen Gross-Schmetterlinge, M. Standfuss, second edition; Lehrbuch der Botanik, E. Strasburger, F. Noll, H. Schenk, and A. F. W. Schimper, second edition; Lehrbuch der Entwickelungsgeschichte, O. Hertwig, fifth edition; Ueber einige Probleme der Physiologie der Fortpflanzung, Dr. G. Klebs: Jena, Fischer. On the Development and Structure of the Whale, G. Guldberg and F. Nansen: Bergen, Grieg. Les Cavernes et leurs Habitants, J. Fraipont: Paris, Baillière.

Princeton Contributions to Psychology, Mark Baldwin: Univ. Press, Princeton, U.S. Cladodus Clarki, Claypole: *Amer. Geol.* Reconnaissance of the Gold Fields of the Southern Appalachians, G. H. Becker: U.S. Geol. Survey, Washington. On Memory and the Specific Energies of the Nervous System, E. Hering: Open Court Publishing Company. Crush-Conglomerates of the Isle of Man, G. W. Lamplugh and W. W. Watts: *Quart. Journ. Geol. Soc.* A New Theory of Hearing, Dr. C. H. Hurst: *Trans. Liverp. Biol. Soc.* Fossil Mammals of the Uinta Basin, H. F. Osborn. On the Osteology of Agriochœrus, W. L. Wortman. On the Platypus Embryo from the Intra-Uterine Egg, J. P. Hill and C. J. Martin: *Proc. Linn. Soc. N.S.W.* Sensory Canal System of Fishes, W. E. Collinge: *Proc. Zool. Soc.* New Molluscs from Borneo, Godwin-Austen and Collinge: *Proc. Zool. Soc.* Les Variations periodiques des Glaciers, F. A. Forel: Rey and Malavallon. Notes on Geography, Geology, &c., of Iceland, Dr. H. J. Johnston-Lavis: *Scottish Geographical Mag.* The Relations between the Movements of the Eyes and the Head. A. Crum Brown: Frowde. On the Cœlomic Fluid, Lim Keng: *Phil. Trans.* A Journey to Roraima, Quelch: *Timehri.* New Facts bearing on Glacial Features, W. Howchin. Decimal Classification, Bibliographia Sociologica, Bulletin, &c.: Institut International de Bibliographie, Brussels.

Knowledge, October. The Museum, Sept. & Oct. (Albion, U.S., W. F. Webb). Review of Reviews, December. The Essex Naturalist, Nov. & Dec., 1894, Jan. to June, 1895. Journal Essex Technical Laboratories, October. Naturalists' Chronicle, Sept. & Oct. The Photogram, Jan. to Dec., 1895. Journal of Marine Zoology, October. Nature, Nov. 21, 28, Dec. 5, 12. Literary Digest, Nov. 23, 30, Dec. 7. Revue Scientifique, Nov. 16, 23, 30, Dec. 7, 14. Johns Hopkins University Circulars, November. Irish Naturalist, December. Feuille des jeunes Naturalistes, December. American Journal of Science, December. Victorian Naturalist, September. Science, Nov. 15, 29, Dec. 6. Scottish Geographical Magazine, December. Westminster Review, December. Knowledge, December. Proc. Roy. Soc. of Victoria, vol. vii. Naturæ Novitates, November. Trans. Perthshire Soc. Nat. Sci., 1894-5. Year Book for 1895: Library Association. Rod and Gun, December 14.

OBITUARY.

HENRY SEEBOHM.

BORN JULY 12, 1832. DIED NOVEMBER 26, 1895.

WE regret to record the death of Mr. Henry Seebohm, the distinguished ornithologist and traveller, who had never fully recovered from an attack of influenza experienced last spring. Though of Scandinavian descent, his parents belonged to a Quaker family residing at Bradford, Yorkshire, where he was born sixty-three years ago. His sole education was received at the Quakers' School in York, and he early entered business. He eventually amassed a fortune in the steel industry, and retired from active management of business affairs about twenty years ago. From his earliest youth, Seebohm had been devoted to the study of natural history, and when ample leisure and means came he entered the pursuit of ornithology with enthusiasm. He travelled first in the Eastern Mediterranean region, making observations and collections; next he accompanied Mr. Harvie Brown in 1875 in a journey to the Petchora River; and finally, in 1877, visited the tundras of the Yenissei region, being taken out by Captain Wiggins. The general results of these later travels were embodied in his popular works, "Siberia in Europe" (1880) and "Siberia in Asia" (1882). The scientific results appeared in the *Ibis* and the *Journal of the Royal Geographical Society*. At the same time, Mr. Seebohm made a detailed study of the thrushes, and prepared vol. v. of the British Museum Catalogue of Birds, which deals with that family and was published in 1881. He also published valuable treatises on "British Birds" (4 vols., 1882–85), on "The Geographical Distribution of Plovers, Sandpipers, and Snipes" (1888), and quite recently on "The Birds of the Japanese Empire." His latest efforts were devoted to the classification of birds. Mr. Seebohm was for many years a generous donor to the British Museum, where the whole of his valuable collection is now safely housed. His great donation of birds' eggs forms one of the most conspicuous features of the study series. His genial presence will also be sadly missed by the Royal Geographical Society, of which he was an honorary secretary at the time of his death.

GEORGE EDWARD DOBSON.

BORN SEPTEMBER 4, 1844. DIED NOVEMBER 26, 1895.

AFTER a long illness, Surgeon-Major G. E. Dobson died on November 26 last. An Irishman by birth, he graduated in the

Faculties of Arts and Medicine in the University of Dublin, and entered the Army Medical Service in 1868. He retired, owing to ill-health, in 1888. Taking a deep interest in comparative anatomy, he devoted himself to the study of the small mammals belonging to the Orders Chiroptera, Insectivora, and Rodentia, and contributed articles on these groups to the last edition of the "Encyclopædia Britannica." Besides numerous small papers, he published a "Monograph of the Asiatic Chiroptera" in 1876, and the British Museum Catalogue of Bats in 1878. He also left unfinished "A Monograph of the Insectivora, Systematic and Anatomical," of which the first two parts appeared in 1882–83. He was elected a Fellow of the Royal Society of London in 1883.

LUDWIG RÜTIMEYER.

BORN 1825. DIED NOVEMBER 27, 1895.

DR. RÜTIMEYER, the eminent Professor of Zoology in the University of Basle, who had been in failing health for some years, died on November 27 at the age of 70. He was born at Biglen, in the Emmenthal, and received a liberal medical education, having pursued his studies in Berne, Leyden, Paris, and London. Pure science early had charms for him, and in 1848 he published his first paper on the geology of the mountains between the Lake of Thun and his native valley. After election to his Professorship in 1855, he devoted his original researches chiefly to fossil vertebrate animals and the human skull, and began with a study of the bones found in the pile-dwellings of Switzerland. In 1861 there appeared his well-known memoir on the remains of the pig from these dwellings, and this was quickly followed by others. In 1864 he published the fine volume of "Crania Helvetica" in conjunction with his colleague Professor His. In 1867 appeared his important work on cattle, which reviewed the osteology of recent forms with special reference to all the known fossils. He was thus led to study the series of Siwalik fossils presented by Falconer and Cautley to the British Museum, and another memoir followed in two parts in 1877–78. His memoirs on the osteology and dentition of the Cervidæ (1881–83) are also of great importance to palæontologists. In 1867 and 1873, Rütimeyer published a now classic memoir on the Upper Jurassic Chelonia of Soleure, Switzerland; and his latest monograph of importance, issued by the Swiss Palæontographical Society in 1891, dealt with early Tertiary mammalian remains from Egerkingen, Switzerland, especially in comparison with corresponding fossils discovered in America, in deposits supposed to be of the same age. Up to the last, the old Professor's interest in the collections with which he had been so long associated was actively maintained, and his decease was painfully sudden and unexpected.

JÖNS JÖNSSON.

BORN MARCH 31, 1848. DIED AUGUST 29, 1894.

WE regret to learn of the death by accidental drowning of this energetic field-geologist attached to the Geological Survey of Sweden. Intended at first for the priesthood, it was not till about his thirtieth year that Jönsson turned to geology. Son of a landed proprietor in South Scania, and connected with quarries in his early youth, he was naturally led to the practical side of the science, and greatly assisted in the agronomic development of his country by his investigation of the softer rocks and superficial deposits. Of late years he had largely devoted himself to an examination of the composition of the clays of Sweden, with reference to their utility for bricks and terra-cotta, and it is a loss to his land and to science that he died before his contemplated work was published. Jönsson's name is to be found on five agronomic maps published by the Swedish Geological Survey, and in other publications of that department. He also published in *Geologiska Föreningens i Stockholm Förhandlingar*, in *Tidning för Stockholms läns Hushållningssällskap*, in *Orebro läns Hush.-sällsk. quartalskrift*, and in the memoirs of the Royal Agricultural Academy (*Kgl. Landbr. Ak. Handl.*). The value of his work, which is great, is due to the strictly scientific manner in which it was conducted, and to his study of natural processes in preference to empirical beliefs. A sympathetic notice by Hjalmar Lundbohm, from which our information is extracted, appears in *Geol. För. i Stockholm Forhdl.*, vol. xvii., which has only just come to hand.

ON November 11 last, European naturalists were startled by a telegram announcing the death of Dr. George Dawson, of the Geological Survey of Canada. The person meant was probably Professor GEORGE LAWSON, of Dalhousie College, Halifax, who died in that town on November 10.

Among other deaths which it is our misfortune to announce are those of Professor A. E. FOOTE, the mineralogist and dealer, of Philadelphia, who died at Atlanta, Ga., on October 10; Dr. F. M. STAPFF, the geologist, at Usumbara; he had only recently proceeded to Africa, at the request of the German East African Company, to prospect for gold; CHARLES TYLER, who was formerly associated with the late Dr. J. S. Bowerbank in his researches on sponges and protozoa, on November 2, in his 70th year; A. J. WÖRTOW, Professor of Bacteriology at Moscow; DR. CARL STECKELMANN, the African explorer, who was drowned on August 25; MR. EDWARD PHILIP LOFTUS BROCK, Honorary Secretary of the British Archæological Association, on November 2; E. L. RAGONET, President of the Société Entomologique of France, and an eminent lepidopterist, in Paris, on October 17.

NEWS OF UNIVERSITIES, MUSEUMS, AND SOCIETIES.

THE following appointments are announced:—H. A. Miers, of the British Museum, to be Professor of Mineralogy in the University of Oxford; Henry Lewis to be Professor of Mining in the Durham College of Science, in succession to Professor Merivale; Dr. J. D. Gilchrist to be Marine Biologist to the Government of the Cape of Good Hope; Professor Edward Grant Conklin, of the Northwestern University, Evanston, Ill., to be Professor of Comparative Embryology at the University of Pennsylvania, in place of the late Dr. John Ryder; Dr. Harrison Allen, Ex-Director of the Wistar Museum, to be Emeritus Professor at the same University; Edward Pierce, Ph.D. (Harvard), to be Instructor in Psychology at Michigan University; W. D. Frost, of the Minnesota Board of Health, to be Assistant in Bacteriology to the University of Wisconsin; Dr. R. M. Bagg to be Assistant in Geology, Johns Hopkins University; Dr. J. C. Merriam, a former pupil of Professor von Zittel, to be Instructor in Palæontology in the University of California; Dr. H. P. Johnson to be Curator of the Museum of the same University; D. T. MacDougal to be Professor of Botany in the University of Minnesota, U.S.A.; Dr. G. P. Grimsley to be Professor of Geology and Biology at Washburn College, Topeka; Dr. G. Lagerheim, of Tromsö, to be Professor of Botany and Director of the Botanical Institute in the University of Stockholm; N. Kusnetzoff, of the Botanical Gardens in St. Petersburg, to be Professor of Botany at Dorpat University; Dr. R. Metzner, of Freiburg, to be Professor of Physiology at Basle; Professor W. Branco, of Tübingen, to be Professor of Geology and Mineralogy at the Academy in Hohenheim, Würtemberg; Dr. J. Sobotta, of Berlin, to be Prosector at Würzburg University; Dr. Strahl, of Marburg, to be Professor of Anatomy in Giessen, in succession to Professor Bonnet; Dr. Th. von Wienzierl, teacher in the High School of Agriculture, to be Director of the State Seed-Testing Station in Vienna; Dr. F. Krasser, as Assistant in the Botanical Department of the State Museum in Vienna; Dr. F. Czapek to be Assistant and Dr. W. Figdor to be Demonstrator at the Institute of Physiological Botany of the Vienna University; Professor F. Ruth, of Vienna, to be Professor of Geodesy in the Technical High School at Prague; Professor M. Vladescu, of Jassy, to be Professor of Botany at Bucharest, in place of the late Professor Brandza; Professor Vladescu is succeeded by Dr. A. P. Popovici.

WE are glad to learn that Mr. H. N. Ridley has been definitely re-appointed Director of the Department of Gardens and Forests in Singapore, the Government having reconsidered its proposition to abolish the office.

SIR WILLIAM FLOWER has been elected a Foreign Member of the Royal Academy of Science, Stockholm.

THE Rev. Canon A. M. Norman has been presented by the Bishop of Durham to the Rectory of Houghton-le-Spring.

THE first meeting of the General Committee for the promotion of a memorial to the late Professor Huxley was held in the theatre of the Museum of Practical

Geology, London, on November 27, under the Presidency of the Duke of Devonshire. It was unanimously resolved that a statue should be offered to the Trustees of the British Museum to be placed in the Natural History Museum at South Kensington; that a gold medal should be established as a students' prize for Biology in the Royal College of Science; and that any surplus fund should be disposed of as the executive committee might think best for the promotion of Biological Science. Numerous local committees are being formed for the collection of subscriptions, and it is hoped that the fund will be of an international character. The promises of support from abroad are remarkably numerous.

ON December 16, Professor T. G. Bonney received a well-merited compliment at University College, London. His former students, both in Cambridge and London, presented him with a portrait of himself.

MR. E. S. GOODRICH, of Merton College, Oxford, has been elected to the Biological Scholarship at Naples for the year 1895–96.

THE Walsingham medal has been awarded by Cambridge University to Mr. J. L. Tuckett, fellow of Trinity College. Essays for the next award are to be sent in to Professor Newton by October 10, 1896.

ON October 30, 1895, Mr. John D. Rockefeller gave a million dollars to the University of Chicago, and has promised to go as far as another $2,000,000 in equalling any contributions that may in future be promised by others. Mr. Rockefeller's donations to this institution now amount to about $7,600,000.

ACCORDING to *Science*, the University of Minnesota has five new buildings nearly completed. They are (1) Medical Laboratories ($40,000); (2) Armory ($100,000); (3) Dairy Laboratories ($30,000); (4) Dining-hall and Dormitory for School of Agriculture ($30,000); and (5) Astronomical Observatory ($10,000). The new dietesting works ($25,000) are this year opened for experimental work.

WE have before (vol. vi., p. 430, June, 1895) alluded to the energetic field-work in geology carried out by Kansas University. A regular Geological Survey was started in the spring of last year in connection with the University, and receiving money from the State through that channel. Professor Haworth is at the head of the Survey. The legislature has also created a State Board of Irrigation, of which the Professor of Geology in the University is *ex officio* a member, and this places additional funds at the disposal of the University. During the summer of 1895, some dozen men were employed, five working on the water problems in the western part of the State, two mapping the Cretaceous, one studying the salt deposits, one the glacial phenomena in north-eastern Kansas, and others working on the stratigraphy of the Carboniferous rocks. On the last subject a volume is now ready for publication, as well as a preliminary report on the water supply of West Kansas. As yet, however, no provision has been made for the publication of this and other material. Meanwhile, Professor Haworth has given an account of the stratigraphy of the Kansas Coal-measures in the December number of the *American Journal of Science*.

TORONTO University has just completed a new museum, which was opened on November 15 last.

THE late Mr. James Carter has left his collection of fossil Crustacea to the Woodwardian Museum, Cambridge, in which his collection of local fossils has long been deposited.

THE Trustees of the British Museum have just published a "Guide to the British Mycetozoa exhibited in the Department of Botany. . . . by Arthur Lister"; the appearance of the real author's name on the title-page is a commendable innovation. The Guide consists of forty-two 8vo pages, with numerous text-figures, and is sold for 3d. Mr. Lister is responsible, not only for the Guide, but for the collection, which, together with the beautiful coloured drawings by Miss Lister, was presented by him, and now forms one of the most intelligible and attractive exhibits in the Natural History Museum.

WE understand that the Council of the Geological Society of London has decided to recommend the Fellows to offer their large collection of minerals, rocks, and fossils to the Trustees of the British Museum. The Royal Society and Zoological Society of London disposed of their museums in this manner many years ago. Negotiations are now pending, and it is hoped that some definite proposition may be submitted to the consideration of the Fellows before the annual meeting in February next.

IN connection with the Education Department's decision, to which we have often alluded, to allow time spent in museums under certain conditions to count as school attendance, the authorities of the Manchester Museum have organised a series of demonstrations, to be given by Mr. Hoyle, to school teachers. It is intended not so much to impart systematic instruction in natural science as to afford teachers an opportunity of becoming acquainted with the resources of the museum, and to suggest methods of effective museum teaching. We hope other museums will follow the lead of Whitechapel and Manchester.

HUDDERSFIELD is singularly behind the times in the fact that it possesses neither free library, art gallery, nor rate-supported museum. Some time ago Sir Joseph Crosland offered £6,000 as a start for a free library, but the offer was declined by the Town Council. More recently, Mr. S. L. Mosley offered the whole of the contents of the Beaumont Park Museum—about 100,000 specimens—to start a town museum, but this offer also was declined after six months' consideration by the Town Council. We also understand that the School Board of Huddersfield continues to ignore the study of natural history. Under these circumstances, we are glad to refer to the valuable work being done by Mr. S. L. Mosley, who has now put up a new museum building, in which he is continuing and increasing the educational work that he has been carrying on for the past fifteen years. His museum is largely used by beginners from all parts, who in him find a willing helper. It is pleasing to record that this museum is open on Sundays, on which day many working-people avail themselves of the opportunity to bring specimens for comparison and naming. A meeting of local naturalists takes place at the museum on the first Monday of each month. Mr. Mosley has sent us his *Report and Monthly Circular* for 1895; in future this will be merged in the *Naturalists' Journal*, which has been acquired as the organ of the museum.

WE are glad to learn, from one of our special correspondents, of good work being done at the Saffron Walden Museum. This is a private museum, founded by the Gibson family of that town, and is governed by trustees. It is supported out of the trust funds, supplemented by the annual subscriptions of interested residents. It is, however, open to the public other than subscribers, at the discretion of the curator. The Museum contains a valuable African collection brought home in the early part of this century, also a set of the Crag fossils of the county, and some interesting local antiquities, all arranged as well as the limited space permits. G. M. Maynard, who has sole charge of the Museum, has found time to elaborate some instructive exhibits with good labels, such as the small case explaining the structure of a sea-urchin. Some cases showing the life-histories of certain insects have very lengthy labels; these have been cut up and pasted on a strip of canvas wound on two cylinders like a perpetual almanack. The pleasure

of winding these labels attracts the youth of Saffron Walden to their perusal; so that the ingenious contrivance has more than one advantage. Mr. Maynard, whose wax models of fungi are well-known, and may be seen in the Museum of the Science and Art Department in South Kensington, is now preparing a series showing the various stages of harmful insects on their appropriate food-plants. The educational value of this Museum to the well-known Grammar and other schools of Saffron Walden is so great that we hope some co-operation between the Trustees, the Municipality, the Schools, and the enlightened Essex County Council may place it on a more permanent and satisfactory financial basis. A single curator in want of funds is too little for the scientific advantage of the Museum, the credit of Saffron Walden, or the material prosperity of the community.

A GUIDE to the Norwich Castle Museum has been prepared by Mr. Thomas Southwell. It chiefly deals with the collection of birds, and is cheap at 6d.

MR. T. M. MACGREGOR has presented the Perth Museum of Natural History with his fine collection of insects, both local and general. An account of this Museum, recently opened by Sir William Flower, has been furnished us by its energetic curator, and will be found among our articles.

THE Report of the Trustees of the Australian Museum, Sydney, for 1894, which has recently been sent us, shows that the Museum is still suffering in all its branches from the financial depression of a few years ago. No more than £20 has been spent in the purchase of specimens, and no collecting expeditions have been sent out. "The staff still continues at the reduced strength, and the forced economies of late years are beginning to tell on the efficiency of the institution. The duplicate collections are almost exhausted in some groups, and no means of replenishing them are available. The few hands allowed being insufficient for the proper maintenance of the Museum, it may be found impossible to open the new hall and galleries to the public until Parliament shall have granted sufficient funds for the engagement of further attendants to clean and watch them." The cases of the new Geological Hall, built in 1891, have long remained useless owing to the absence of locks. £400 has at last been voted by Parliament to supply these necessary fittings, and the collections are now being arranged in the cases, the fossils on the ground floor, the minerals in the first gallery, and recent Invertebrata in the upper gallery. The necessity for new cases is very greatly felt, and Mr. Etheridge thinks that he can hardly find room for additions, especially in the divisions of Mammalia, Osteology, and Ethnology. Circumstances, we presume financial, have prevented the appearance of the *Records* of the Museum; but, altogether, the Report is so disheartening that we forbear to quote further complaints. We are glad to see that the snakes are to be exhibited to the public by means of a series of casts, coloured from nature, which will show, not only the largest adult forms, but also variation in colour and stages of growth. The successful appearance of these casts in the National Museum at Washington fully warrants this new departure (see NATURAL SCIENCE, August, 1894, Supplement). A new method of exhibiting fish has also been begun, namely, "by placing the dried skins, suitably prepared, on a clear run of vertical fittings, immediately within the glass front of the containing case. In preparing the specimens, the latter are flattened on the unexposed side, so as to accommodate them to the vertical surface." For the exhibition of the Australian Lepidoptera, Coleoptera, and other insects, Mr. F. A. A. Skuse has devised a series of thirty-six large cork trays held in a suitable frame-work in the wall-cases, immediately within the glass. Upon the trays is placed a framed series of plates from Scott's "Lepidoptera." The new arrangement of the Invertebrata by Mr. Thomas Whitelegge, who has arranged 1,340 specimens of Foraminifera, Porifera, and Actinozoa, is very highly commended by Mr. Etheridge. The fine collection illustrating the ethnology of Australia and the South Pacific Islands has long been exceedingly crowded, and an extension of the building is urgently required. This collection has recently been enriched by a set of weapons and implements of the

Alligator River Tribes, Northern Territory, and by numerous urns and vases from the burial mounds of Arkansas, U.S.A., as well as by a series of objects recently obtained by the secretary, Mr. S. Sinclair, in the New Hebrides. Mr. Etheridge's duties as curator of the Museum have necessarily interfered with his valuable palæontological work, since he has hitherto been practically the only palæontologist at the service of both the Museum and the Geological Survey. It is to be hoped that he may receive some additional assistance in this department. We note that while the average attendance on week-days of seven hours' duration is 330 per diem, it reaches 660 per diem for the Sunday afternoons of three hours.

WE have received the Annual Report of the Provincial Museum at Lucknow for the year ending March 31, 1895. The completion of the alterations in one of the buildings has enabled Dr. Führer, the Curator, to re-arrange the collections in a more satisfactory manner, and a guide-book is now being prepared. The Government grant for the purchase of specimens is still extremely small; but the liberality of private and official donors fortunately goes far to make up for this want of funds. The Museum staff also collected 124 natural history specimens during the year. The Curator being Archæological Surveyor of the N.W. Provinces, many important inscribed slabs and images have been secured for the Department of Archæology, including six polished marble slabs, with Sanskrit and Prakrit inscriptions, dating from the middle of the 12th century A.D.

THE staff of the Department of Insects of the U.S. National Museum has been re-organised as a result of the death of C. V. Riley. L. O. Howard, entomologist of the U.S. Department of Agriculture, has been appointed Honorary Curator of the Department of Insects; Wm. H. Ashmead, custodian of Hymenoptera, and D. W. Coquillett, custodian of Diptera. All museum custodians are honorary officers. M. L. Linell will remain as general assistant to the Honorary Curator.

IN view of the eleventh International Congress of Americanists, which was held last October in the City of Mexico, the National Museum of Mexico prepared six new catalogues, (1) of the collection of mammals, (2) of birds, (3) of reptiles, all by A. L. Herrera, to whose remarks on nomenclature we allude on another page; (4) of the collection of Anthropology, by A. L. Herrera and R. E. Cicero. There was also a guide to the Museum and a new catalogue of the Archæological Department.

THE Pharmaceutical Society of Great Britain has sent us its "Museum Report for the year 1893-4," compiled by the curator, Mr. E. M. Holmes. This consists chiefly of a list of plants used in medicine, of which specimens have been presented or recently purchased. Useful information and references are given, so that the book will be valuable to others than those visiting the museum.

MR. GEORGE W. VANDERBILT has started a museum and arboretum at his home at Biltmore, in North Carolina. He has recently purchased the collection of Southern plants which formed the material for Dr. Chapman's "Flora of the Southern States."

THE Belfast Naturalists' Field Club is to be congratulated on the energy its members are displaying in the pursuit of natural history. The course on Botany (structural and systematic) which Professor Johnson, of the Royal College of Science, Dublin, conducted under the Club auspices in the spring of this year is being continued this winter under the guidance of the Rev. C. H. Waddell, M.A., who himself went through the spring course. Recently the Club has published a substantial *Supplement*, by S. A. Stewart and R. H. Praeger, to the "Flora of the North-East of Ireland," by Stewart and Corry. It is a matter for regret that the flora of the rest of Ireland is not as well worked out as that of the north-east portion. But workers so devoted as Mr. Stewart are rare. The Field Clubs of Dublin and Belfast began

their winter sessions with successful conversaziones. Professor Grenville Cole succeeds G. H. Carpenter as president of the former society.

At the General Meeting of the City of London College Science Society on November 27 it was decided to select a president "who will make a point of presiding at the society's meetings." The choice happily fell upon Professor J. Logan Lobley.

The Oxford University Junior Scientific Club has prevailed on Professor W. Ramsay to deliver the fifth 'Robert Boyle' Lecture next summer term. Mr. E. C. Atkinson, of St. John's, is the president-elect.

The "Triton," a kind of aquicultural society in Berlin, proposes to give three prizes as follows:—(1) for a means of destroying the animal and vegetable ecto-parasites of fish, 700 M.; (2) for a means of destroying the hydra of fresh-water, 400 M.; (3) for a plan for killing *Tubifex rivulorum*, 200 M. These plans are destined to be used principally in aquaria, and must be simple, practical, and innocuous to both fish and aquatic plants. The papers, in German, French, English, Italian, or Russian, should be sent signed with a motto, and accompanied by a sealed envelope, containing the motto and the sender's name, to Professor F. E. Schulze, 43 Invalidenstrasse, Berlin, before July 1, 1897.

The *British Medical Journal* states that a bacteriological laboratory, under the directorship of Professor Hankin, is to be established at Agra by the Indian Government. Health officers are to have a six months' training in bacteriology, and 1,900 municipalities will be expected to appoint trained men for sanitary work. Further laboratories are likely to be started in other parts of India.

The Health Committee of the Glasgow Town Council also intends to establish a complete Bacteriological Department in the sanitary buildings now being erected.

The November number of the *Journal of the Essex Technical Laboratories* states that a three weeks' course of instruction in agriculture will be given at the laboratories during January, 1896. The course will be confined to the study of the cultivation of farm crops, and classes will be held daily from Monday, January 6, till Saturday, January 25. The classes are intended for farmers, farmers' sons, or other persons engaged in agricultural pursuits, and are open to all such as are residents in the county. The lectures will be given by Professor E. Blundell, of the Royal Agricultural College, Cirencester.

A special course of lectures, practical instruction, and laboratory demonstrations is now being given on Marine Zoology at Brightlingsea. The lectures and practical instruction for students are given weekly by Mr. Houston, while the popular demonstrations are given by Mr. Walter Crouch at the Marine Biological Laboratory, on two days a week during the course.

We learn from *Nature* that the Egyptian Government will this year begin a Geological Survey of Egypt. This will occupy about three years and cost £25,000. Captain H. G. Lyons, R.E., who is already known by his papers before the Geological Society, and who is now superintending the excavation of the ruined temples of Philæ, has been appointed to carry out the work.

Professor R. Koehler, of Lyons, has communicated to the *Comptes Rendus* of the Paris Academy of Sciences an account of deep dredgings from the "Caudan," in the Gulf of Gascony, between August 20 and September 2, 1895. The vessel was provided by the Minister of Marine, but the greater part of the material and necessary expenses were furnished by the local authorities. During the short time at its disposal, the expedition let down the trawl twenty times, and made thirty-two deep-soundings. The results have shown that successful deep-sea dredgings can be carried on with very limited means.

A NUMBER of Fellows of the Royal Geographical Society interested in Antarctic exploration are discussing the possibility of organising an expedition by private subscription. It is estimated that a sum of about £50,000 would be required for an adequately-equipped fleet.

MR. F. O. PICKARD-CAMBRIDGE, a nephew of the well-known specialist on spiders, and himself a competent naturalist and artist, has been appointed by the British Museum (Natural History), with the sanction of Messrs. Siemens, to assist Mr. Austen, who, as we have already announced, has left this country in the "Faraday" for Para. Messrs. Siemens intend to lay their telegraphic cable from Para to the mouth of the Rio Negro at Manaos, a distance of 1,100 miles.

THE *Glacialists' Magazine* states that Dr. Karl Grossmann, of Liverpool, who visited Iceland last summer with a medical expedition for the investigation of leprosy, was able to make some interesting observations on the glaciation of little-known parts of that island.

ACCORDING to *Nature*, the Austrian Expedition to establish meteorological stations at Jedda, Koseir, and other places on the Red Sea, has made some satisfactory zoological collections, and during the winter will investigate the southern parts of the Red Sea, between Jedda and Massowa.

MR. CHARLES SCHUCHERT informs us that he has spent a successful summer collecting Devonian fossils, chiefly from New York, Ontario, and Michigan, or as he expresses it, dry-dredging in the Mississippian Sea. An account of his collections, which are now in the U.S. National Museum, is given in *Science* for November 2, 1895. It appears that in some parts of North America the lookers-on imagine that the fossil collector takes his specimens home to gild them; but at Thetford, in West Ontario, a famous locality for Middle Devonian fossils, the inhabitants are so accustomed to the visits of the collector that they have begun to think he may not be insane.

PROFESSOR FREDERICK STARR, of the University of Chicago, has gone to Guadalajara, Mexico, to study a submerged city in Lake Chapala, and to determine whether the dwarfs who inhabit the neighbouring mountains owe their small stature to disease or inherit it from their ancestors.

ERRATUM.

MR. CHALMERS MITCHELL writes to us: "In a 'Note and Comment' in the December number of NATURAL SCIENCE ('Chauna,' p. 380, vol. vii.) you transpose the authorship of two memoirs on Screamers to which you allude. It was Garrod who wrote upon *Chauna derbiana*; the memoir on *Palamedea cornuta* was written by Beddard and Chalmers Mitchell."

NOTICE.

TO CONTRIBUTORS.—*All communications to be addressed to the* EDITOR *of* NATURAL SCIENCE, *at* 22, ST. ANDREW STREET, HOLBORN CIRCUS, LONDON, E.C. *Correspondence and notes intended for any particular month should be sent in not later than the* 10*th of the preceding month.*

TO THE TRADE.—NATURAL SCIENCE *is published on the* 25*th of each month; all advertisements should be in the Publishers' hands not later than the* 20*th.*

THE "CHALLENGER" NUMBER.—*In reply to enquiries, we remind our readers that, although the* FIRST *edition of this ran out of print immediately, there are still some copies of the* SECOND *edition to be obtained at the usual price—* ONE SHILLING. *No more will now be printed, so orders should be sent at once.*

YOUNG GREY-LAG GEESE.

From a photograph by C. Kearton, in "British Birds' Nests," by R. Kearton. Kindly lent by Messrs. Cassell & Co.

[*See p.* 128.